

## Testing messages to promote stair climbing at work

### Abstract

*Purpose:* Worksites have been targeted as an important setting for physical activity interventions. A recent emphasis for health promoters is the use of point-of-choice interventions to encourage stair climbing at work. This study explored three point-of-choice campaigns to increase stair climbing at work. *Method:* Ten focus groups and a rating task were conducted with 59 employees from a University and a University Hospital in the UK. Focus groups were structured around three messages and four prompts and sought to explore the motivational power of the resources, identify factors contributing to their effectiveness and provide recommendations to improve and optimize content. Benefits and barriers to stair climbing at work were also explored. Focus groups were recorded, transcribed and coded to identify key themes. *Findings:* Intra-personal factors health, motivation, social norms and time management influence stair climbing at work. Critically, extra-personal factors associated with the worksite itself can also bias a traveller's choice independently of any intervention. Results suggest that messages targeting heart health have the greatest impact on reported propensity to climb the stairs at work. Messages targeting rate of respiration for fitness, however, may have a negative effect given that most people want to avoid getting out of breath at work. *Originality value:* Qualitative research is essential for developing and refining the design detail of point-of-choice interventions and tailoring their components to address individuals' needs in different settings but there is little evidence of this in practice.

## Testing messages to promote stair climbing at work

## Introduction

Most adults spend half their waking life at work (Dishman, Oldenburg, O'Neal & Shephard, 1998), many in sedentary occupations. The workplace then, offers significant potential as a setting to promote healthy lifestyle behaviors. More specifically though, the workplace may be an effective means of promoting health enhancing physical activity during each day as well as encouraging increased energy expenditure relevant to weight control. The potential for physical activity to reduce long and short term sickness absence in the workplace is well recognized (National Institute for Clinical Excellence, 2008). Workplace health promotion targeting physical inactivity and energy expenditure is therefore increasingly relevant for organizations. Current physical activity recommendations suggest that adults should be active daily. Over a week, this should add up to at least 150 minutes of moderate intensity physical activity (Haskell, Lee, Pate et al., 2007). Performing shorter, 10 minute bouts of activity throughout the day is one way of accruing suggested activity levels for the benefit of cardiovascular fitness. For energy expenditure relevant to weight, however, all activity would require energy expenditure (Levine & Kotz, 2005). One opportunity for accumulating physical activity throughout the day and increasing caloric expenditure relevant to weight is to encourage individuals to climb the stairs instead of using elevators at work.

Stair climbing is a physiologically vigorous lifestyle activity which results in an energy expenditure of 9.6 METs, i.e. 9.6 times the energy of the resting state in the field (Teh & Aziz, 2002). This has important implications for weight control. For example, an 80kg man climbing a typical 3 meter flight of stairs in his home 10 times a day would expend approximately 28 kcals. That is equivalent to four days worth of food or 3 lbs of fat if repeated for a year (Olander & Eves, 2011a). This theoretical effect of stair climbing on

weight was echoed by reductions in waist circumference, body fat and weight after a 12 week worksite intervention in which individuals were encouraged to only use the stairs to move between floors (Meyer et al., 2010). In addition to increases in energy expenditure and weight loss, stair climbing has been experimentally associated with improved cardio-respiratory fitness and cholesterol profile (Boreham, Kennedy, Murphy et al., 2005) whereas observational data indicate decreased risk of cardiovascular disease (Paffenbarger et al., 1986) and stroke (Lee & Paffenbarger, 1998) for those who climb stairs more frequently.

Typically interventions to increase stair climbing place a sign or a poster at the point-of-choice between the stairs and the escalator or elevator encouraging individuals to take the stairs for the benefit of their health (Brownell, Stunkard & Albaum, 1980; Kerr, Eves & Carroll, 2001a). Studies in the United States and the UK have consistently shown that point-of-choice interventions to increase stair climbing (as opposed to using escalators) are effective in public access settings such as airports (Brownell et al., 1980), shopping malls and train stations (Brownell et al., 1980; Kerr, Eves & Carroll, 2001a; Lewis & Eves, 2011). A review of interventions conducted within the workplace, however, cautioned that there was limited evidence that point-of-choice prompts were effective at work (Eves & Webb, 2006; see also Eves, 2008, 2010; Nocon, Müller-Riemenschneider, Nitzschke & Willich, 2010). Data in a review conducted for the Centers for Disease Control (USA) revealed that an average increase for stair climbing of +5.9% for public access settings contrasted markedly with a +0.1% increase for stair use, i.e. ascent and descent combined in workplaces (Eves, 2010; Soler et al., 2010). For public health, the equivocal evidence for effectiveness of interventions at work is problematic; regular stair climbing provides the greatest dividend and the workplace is a plausible location for its occurrence.

Two factors may contribute to this contrast between public access settings and the workplace. First, the difference between worksites and public access settings is not simply one of location. Public access settings typically involve choice between stairs and an escalator whereas at work, pedestrians choose between stairs and the elevator. As Olander and Eves (2011b) demonstrated, variability in waiting time for the elevator could have major effects on stair use. The number of individuals in the building and the number waiting to use the elevator had effects on stair use some 10 times the magnitude of typical intervention effects. Thus, uncontrolled factors in the workplace, related to waiting time for the elevator, may serve to dilute effects of any intervention (Olander & Eves, 2011b). Second, message content may contribute to differences between public access and workplace settings. Webb and Eves (2007) reported that messages that outline a specific health outcome obtainable from stair climbing, e.g. a healthy heart, are most likely to be motivating. In public access settings, short messages are appropriate as the health promotion is encountered as an incidental aspect of a pedestrian's journey. At work, however, more complex interventions may be required to counteract the uncontrolled effects due to elevator availability.

The theory underlying the use of point-of-choice prompts is that they interrupt 'bad' habits at the point of their occurrence by encouraging individuals to deliberate about their behavior allowing the substitution of a health enhancing alternative. When an individual has an intention to be more physically active, the prompt to take the stairs allows that intention to be fulfilled by acting as a reminder that stair choice is health enhancing (Eves, Webb, Griffin et al., 2012; Lewis & Eves, 2012; Olander & Eves, 2011a). Thus, prior intentions to change behavior are central to the effectiveness of point-of-choice prompts. In essence, point-of-choice prompts are post decisional aids as they help individuals to translate their healthy intentions into the planned behavior (Olander & Eves, 2011a). While conventional point-of-choice prompts in the workplace have typically used a general exhortation to use the stairs for

the benefit of health, more recently multi-component interventions have supplemented the prompt at the point-of-choice with an extended message targeting attitudes and intentions (e.g. Eves, Webb & Mutrie, 2006; Olander & Eves, 2011a; Eves et al, 2012). This component not only alerts individuals who wish to change that there is a healthier option, but also gives the reason *why* one should chose the behavior and *how* stair climbing will achieve the outcome related to health. Further, this extended message has been supplemented by single line messages in the stairwell, e.g. stair climbing burns more calories per minute than jogging, which also target attitudes (Eves et al., 2006; 2012).

To date, it is unclear whether the choice of the stairs over the elevator (as opposed to the escalator) is problematic or whether health promotion initiatives in the workplace have employed suboptimal campaigns (Eves & Webb, 2006). The purpose of this study then was to explore the multiple components used in stair climbing interventions to combat physical inactivity and increase energy expenditure in the workplace. Using a series of focus groups and a rating task, this study sought to identify the motivational properties and persuasive appeal of three extended messages and six prompts with employees from the UK. It also sought to explore the benefits and barriers to stair climbing in the workplace.

## Method

### *Participants*

Professional non academic staff were recruited from a University and a University Hospital in the UK via an e-mail advertising the focus groups and offering £20 for participation. Participants qualified for the study if they were free from physical disabilities and chronic disease, worked in a building with at least two floors and had access to stairs.

Eligible volunteers were followed up via e-mail and asked to complete a short demographic questionnaire. Ethical approval was obtained from University's ethics sub-committee.

Sixty-one people responded to the advert and were recruited for the study. Two were absent for their focus group which resulted in a final sample size of 59 (43 women and 16 men) with ages ranging from 18 to 61 years (mean age 40 years). Forty-eight individuals were employed by the University and 11 individuals were employed by the University hospital. Body mass index (BMI) for the total sample ranged between 18 and 45 (mean BMI = 25.2). Twenty-three individuals (40%) had a BMI > 25. The majority of employees were of white British ethnicity (91%).

### *Focus groups*

Ten focus groups were constructed homogenous for gender and weight status (BMI < 25 and BMI  $\geq$ 25) (see Table 1). Focus groups contained between four and eight participants and lasted for approximately one hour. Each focus group was facilitated by a member of the research team. At the beginning of each session, participants were notified of the rules, format and procedure for the discussion. After reading a statement of objectives and assuring privacy discussions were recorded. The interview schedule was semi-structured around three extended messages and four prompts based on the themes weight control, fitness and heart health (see box 1). The interview schedule sought to explore the motivational power of the resources, identify factors contributing to their effectiveness, understand barriers to the acceptability of the resource and to provide recommendations to improve and optimize content. Participants were also asked more general questions about stair climbing, its relationship to physical activity and the benefits and barriers to stair climbing at work. After discussing each message or prompt, a rating task was performed in which participants were

asked to verbally rate the extended messages and prompts on a scale of 1 (not at all encouraging) to 5 (very encouraging).

### *Analysis*

The recorded focus group discussions were transcribed verbatim and coded using a constant comparative approach (Glaser, 1965). Throughout the analysis, coding reliability was checked independently by four members of the research team. This involved allocating specific quotations to the correct core themes. Codes and themes were continually revised until a high level of correspondence was reached, i.e.  $\geq 95\%$  of quotes were allocated to the correct core themes.

For the rating task a 2 x 2 Analysis of Variance (ANOVA) with two between participant factors - gender (male vs. female) and weight status (BMI  $< 25$  vs.  $\geq 25$ ) was then performed on the data to identify group differences. Significant interactions were investigated using independent *t*-tests with Bonferroni correction. Planned comparisons were not performed on men with a BMI  $> 25$  due to the small sample size ( $N=4$ ).

## Results and discussion

Two core themes and five sub-themes emerged; intra-personal factors which encompassed health and motivation and extra-personal factors which encompassed design of the stairs. The sub-themes time (management) and social factors emerged within both core themes.

### **Attitudes towards stair climbing**

Consistent with previous observational research (e.g. Eves et al., 2006) stair descent was reported as more frequent amongst respondents than stair ascent. This is likely due to the

higher energy expenditure associated with stair ascent (estimated gross energy expended during ascent is 9.6 METs compared to 4.9 METs for stair descent [Teh & Aziz, 2002]). Despite this the vast majority of people in each focus group said that they were willing to climb on average two-three floors, similar to a formal questionnaire study in which employees reported that four floors was the maximum (Kerr, Carroll & Eves, 2001b). Women also said that it was something they could do at work to help them lose weight, whereas men said it was something they could do to improve their physical fitness.

“The girls from the office have started doing it as well to try and get some exercise and try and lose a few pounds before Christmas” (overweight female)

### **Benefits and barriers to stair climbing at work**

When exploring benefits and barriers to stair climbing at work two core themes emerged; intra-personal and extra-personal factors. Within these core themes five inter-related subthemes were identified; health, motivation, social factors (social norms and the social environment), time management (personal time management and the spatial-temporal environment) and design of the stairs.

#### ***Intra-personal factors***

##### *Health, motivation, personal time management and social factors*

Health was a benefit and a barrier to stair climbing at work. The health benefits were generally understood to be physiological rather than psychological. It was common knowledge that regular stair climbing improves circulation, heart and respiratory function;

“Gets the old blood pumping round the body” (healthy weight male)



For women stair climbing was also felt to improve weight loss and calorie expenditure. Impaired mobility, excess weight, asthma and joint pain were health related barriers to stair climbing at work;

“I suffer with bad knees as well and I can feel my knees creaking as I’m going and I’m thinking, should I be doing this?” (healthy weight female)

Men with a BMI < 25 felt that stair climbing was stimulating and motivating and closely related to feeling physically better. Paradoxically, motivation was a barrier to stair climbing for most women and overweight men, particularly later in the day when they were tired; “In the morning if I’m feeling quite spritely I might think oh well... at the end of the day, at 5 o’clock, oh I’m so tired” (healthy weight female). This quote echoes previous research demonstrating that pedestrians are more likely to take the stairs early in the day than later (Eves, Masters, McMannus, Leung Wong, & White, 2008).

Saving time is another benefit of stair climbing at work since it reduces the problems associated with scheduling formal exercise sessions. For women especially, finding the time for formal exercise outside of work is difficult due to competing work/life/family demands;

“It’s something that we can do while we’re at work as well ‘cause people lead such busy lives and they’ve got home and they haven’t got time to go to the gym or go swimming or literally go for a walk around the block” (overweight female)

For overweight women stair climbing offers a more acceptable form of exercise than formal exercise sessions. Many feel self-conscious about sweating and exerting themselves in front of more svelte gym users and feel pressured to wear trendy clothes. The stairs, however, are perceived as a gym free alternative; something that can be performed at the travelers own pace, requires no additional clothing or equipment and (for the most part) can be done in

privacy. These qualitative data may in part explain studies in which stair climbing interventions have greater effects in the overweight (Eves et al., 2006; Lewis & Eves, 2011);

“Going to the gym is my worst nightmare, you know with all these thin, fit people, whereas the stairs is really private, you know you’re just going about your daily business nobody knows anything about you or if you’ve got the right kit on or if you know, you’ve got the right type of trainers on” (overweight female)

Despite being an acceptable form of exercise for overweight women, embarrassment about breathlessness and perspiration were associated with negative attitudes toward stair climbing at work;

“For me, it puts me off because of the thought of getting out of breath and sweaty. Normally if I am going up the stairs I am going to meet someone or I am going to a meeting, so that would put me off straight away” (overweight female)

### **Extra-personal factors**

#### *Design of the stairs, time management and social factors*

The design of the stairs at work, i.e. their structure, location and visibility were a barrier to using them. If the steps were too high or too low, too narrow or too long to accommodate the traveler’s footstep and/or pace then this was seen as a potential hazard. Indeed, fear of falling, an intra-personal factor related to health (and safety), was a barrier to stair climbing for some women;

“If the steps are very narrow as well, some of the steps can be a bit, you know these windy ones, some people [might worry about], slipping down them really” (healthy weight female)

Having a large number of floors to climb, i.e. more than two - three floors, and the location or area where the stairs and the elevator are situated was a barrier for using them, e.g. if the elevator is more accessible and visible than the stairs then this acts as a barrier. If, however, the stairs are located in a visible place then this acts as a facilitator. Using the elevator instead of climbing the stairs was also deemed necessary when carrying heavy items or equipment.

Related to this, the temporal environment, i.e. waiting time for the elevator and ‘busyness’ of the stairs had a major influence on mode of ascent. Some argued that stair climbing saves time because the elevator is slower in the sense that you have to wait in order to use it. Others felt that stairs were an obstacle in their path and added unnecessary time to their journey, particularly during high levels of pedestrian traffic (a social factor) since large numbers of people on the stairs make it difficult to move around. From this it is easy to see how a traveler maybe seduced by an empty elevator that is immediately available at work despite a prior intention to climb the stairs for their health (Olander & Eves, 2011b). On the other hand when the elevator is not available, very busy travelers may choose the stairs, not because of a prior intention, but simply because it provides a faster route to their destination. In sum, the layout of the building, pedestrian traffic and variability in waiting time for the elevator have major reported effects on stair use at work.

### ***Reactions to extended messages and prompts***

#### *Weight control*

The extended message (see box 1) resonated well with women regardless of weight status due to their higher level of interest and involvement in weight loss. Amongst men with

a BMI < 25, this message had less of an impact since weight loss was afforded a much lower priority;

“Weight is always you know, at the forefront of everyone, well most people, especially you know if you're female” (healthy weight female)

This was supported by ratings which revealed a significant main effect of gender ( $F(1, 50) = 4.19, P = .05$ ) and BMI ( $F(1, 50) = 12.53, P = .001$ ) and a significant gender by BMI interaction ( $F(1, 50) = 10.65, P = .002$ ). Inspection of table 2a reveals that women and those with a BMI > 25 scored the weight control message significantly higher than men and those with a BMI < 25. The gender by weight interaction was explored using Bonferroni corrected *t*-tests. These analyses show that there was no difference in women with a BMI < 25 vs. > 25 ( $P > .05$ ) suggesting that the extended message resonated well with women regardless of weight status. There was however a significant difference between men and women with a BMI < 25 ( $t(30) = 4.63, P < .001$ ) suggesting that men scored the message significantly lower, supporting reports that messages about weight loss had less impact for men.

Specific information about the amount of calories burned when stair climbing was important to women. Fat loss, and the link between calories and fat loss, were also key pieces of information, presumably because fat loss provides a more tangible benefit. For men and some overweight women however, ‘calories’ still were too abstract and they struggled to conceptualize 28 calories or 3lbs of fat. For this reason they felt that a more concrete exemplar for calories was required. Many suggested using foods such as biscuits or Big Macs. Others felt that the message would be more effective by placing greater emphasis on weight loss or weight maintenance rather than calories;

“Shame you can't have a comparison to give you an idea what 28 calories looks like in real terms” (healthy weight male)

Many respondents, regardless of BMI, were disappointed at how few calories were burned and how little fat was lost over a year. Thus, for many the costs they incurred stair climbing outweighed the benefits rendering the message not very encouraging

The weight control prompts were generally well received by women for the reasons outlined earlier. It was widely acknowledged, however, that they would only motivate stair climbing in those who wanted to lose weight. Again this was supported by ratings which revealed a significant main effect of gender ( $F(1, 45) = 13.90, P = .001$ ) and weight ( $F(1, 45) = 5.75, P = .02$ ) for the prompt ‘*stair climbing always burns calories*’. The results showed that women and those with a BMI > 25 scored this prompt significantly higher than men and those with a BMI < 25. Those with a BMI > 25 may be those more likely to want to lose weight (see Table 2a).

Overall, participants were most enthused by the exemplar; ‘*Stair climbing burns more calories per minute than jogging*’. This was supported by ratings (see Table 2a). First of all jogging was an activity that most people had tried and so it was well known for the physical effort involved. It was also perceived to be a high calorie burner. Stair climbing on the other hand was seen as a much easier alternative with the added benefit of burning ‘*more*’ calories per minute. This information was rewarding, especially amongst those who reported low levels of fitness during the discussion;

“I don’t jog and I can’t jog and the thought of it is just not something that appeals to me. So I would find stair climbing much more attractive than jogging but the added benefit is, is that it is better as well” (overweight female)

For some men and regular joggers, however, this information was not motivating because of the duration of the activities and the physical effort involved;

“The thing is, that people who go jogging generally go and do it for an hour, an hour and a half, I mean you’re not gonna climb the stairs for 40 minutes or an hour and a half, so it’s, you’re kind of looking at quite different things really” (healthy weight male)

The ratings support this point since those with a BMI < 25 scored this prompt about jogging significantly lower than those with a BMI > 25 ( $F(1, 36) = 20.10, P < .001$ ).

### *Fitness*

Comments about the fitness message suggested that it had the least impact of all three extended messages (also see table 2b), despite the fact that it had the same overall rating as the message about weight control. This was in part due to the fact that fitness was afforded a much lower priority than weight loss and heart health. Additionally, for most people, deep or rapid breathing was something to be avoided at work. Many interpreted it as a sign that they were physically unfit, thus reducing their self-esteem, while those who were overweight felt embarrassed or self-conscious if seen gasping for breath in front of colleagues at work;

“Um that wouldn’t encourage me uh... ‘cause you’re walking up the stairs and you’re getting out of breath and you’re feeling like ‘oh... I don’t feel any fitter now so I am not going to go up the stairs ‘cause I don’t feel good now’ so I don’t think that’s very good. Whereas the other one it’s like lose this much weight and you can actually relate to it but it’s not a nice feeling to get out of breath so...” (overweight female)

There was a small group of participants who felt encouraged and reassured by this information (generally older women). For this group, the message served to reinterpret the

physiological response of stair climbing to reduce negative perceptions of breathlessness; “that’s encouraging you because it’s saying it’s ok to get out of breath”. No significant differences emerged between subgroups based on their ratings (all probabilities > 0.05).

With regard to the prompt “*the stairs are your free gym. Why not use them?*” people were motivated by the fact that stair climbing is free and accessible to everyone (also see table 2b). For overweight women and those with low levels of fitness, a gym-free alternative to exercise was an added bonus. This echoes previous comments about the acceptability of stair climbing vs. formal exercise sessions;

“I think that’s quite a good statement actually ‘cause we talked about it before the fact that people don’t like going to the gym, don’t like using the kit at the gym, haven’t got the time or can’t afford it then it is a good free way of encouraging people to get fit” (overweight female)

Conversely, some women and overweight men argued that stair climbing was not the same as going to the gym because of the physical effort involved, and so for some this statement lacked credibility. There were no significant differences between subgroups based on their ratings;

“I don’t believe it... it’s not gonna be the same as going to the gym” (healthy weight female)

### *Heart health*

The extended message based on the theme heart health was the most encouraging for the vast majority. It also received the highest score. First of all the information conveyed an unfamiliar message that was new and interesting; “I think it’s a message that you don’t often

hear... the getting fit and calories one might be one you've heard before, but this one perhaps you don't think of" (healthy weight female). Participants also felt that the content of the message was direct and powerful since everyone is motivated to avoid a heart attack;

"That really does hit home, yeah. Because never mind whether you're overweight or out of breath or whatever, a heart attack's a heart attack" (overweight female)

In particular, most felt that allocating seven minutes a day for stair climbing was easily achievable taking into account the total number of minutes in one day. That said, some felt the message should be more explicit about how seven minutes can be achieved, i.e. accumulated throughout the day;

"When you've broken down the times and only 7 minutes... Yeah it doesn't seem a lot really" (healthy weight female)

Although heart health was an important issue for everyone, some participants suggested that the message was too future orientated and that it would be more effective if it focused on the immediate benefits rather than long terms health outcomes;

"I mean the time frame of the ten years... you want something like I dunno, couple of years, something like that, something shorter – the immediate benefit rather than the long term" (healthy weight male)

There were no significant differences between subgroups in the ratings.

The prompt "*Regular stair climbing gives your heart a workout*", was understood by respondents on two different levels. Some perceived it as a message about health, i.e. protecting your heart, while others saw it more as a message about physical fitness. The information resonated well with older women and those who are overweight as they



appreciated the simplicity of the information and felt that it was a “good strong reminder”. These people tended to view the information as a message about health. Amongst men and younger participants there was a strong sense of familiarity about the statement and so the prompt made less of an impact; “I don’t think it tells you anything you don’t already know”. This was supported by ratings in that women and those with a BMI > 25 scored this prompt significantly higher than men ( $F(1,44) = 8.18, P = .006$ ) and those with a BMI < 25 ( $F(1,44) = 9.21, P = .004$ ).

### General discussion

Results suggest that stair climbing is an appropriate target for work place health promotion aimed at increasing physical activity and energy expenditure relevant to weight control. When exploring general attitudes towards stair climbing at work, for example, employees said that it was a form of physical activity and that they were willing to climb two/three floors in one go. Women also said that it was something they could do at work to help them lose weight, whereas men said it was something they could do to improve their physical fitness. Stair climbing then is an acceptable method of increasing physical activity and energy expenditure in the workplace and is well received by employees.

When exploring the benefits and barriers to stair climbing at work two core themes and five sub-themes emerged; intra-personal factors which encompassed health and motivation and extra-personal factors which encompassed the structure and location of the stairs. Potential effects of time management and social situations occurred within both factors. These broad themes echo socio-ecological models in which both intra-personal (e.g. health) and extra-personal (e.g. environment) factors influence behavior (Sallis et al., 2006). Within this framework, physical activity is the outcome of many interacting factors both within and across the four different levels of intra-personal, socio-cultural, physical and

policy environments. While temporal aspects of behavior are less well documented in Socio-Ecological models, the workplace can be a time-pressured environment and potential effects of time were identified within both themes. For instance, at work, the stairwell may be some distance from the entrance and less visible than the elevator. This physical environmental factor may interact with time since pedestrians tend to use the first available or quicker mode of ascent (Eves et al., 2009; Olander & Eves, 2011b). Social factors such as pedestrian traffic flow are also related to time and the physical environment. Large numbers of people on the stairs were reported as making it difficult to move around adding unnecessary time to the journey. Effect of pedestrian traffic such that they reduce stair use are unique to the workplace (e.g. Eves, Webb, Griffin & Chambers, 2012) and in marked contrast to public access settings where increased pedestrian traffic consistently increases stair use (e.g. Kerr, Eves & Carroll, 2001c). In addition, environments can influence behavior relatively automatically by biasing choice. As noted above, visibility and accessibility of the stairs relative to the elevator influences choice. Consequently, stair climbing can become associated with the context in which it is performed. When confronted with the familiar sight of the elevator individuals mindlessly proceed in this manner. These biasing effects of the environment have been termed ‘passive’ nudges (Kremers, Eves & Andersen, 2012) to distinguish them from the ‘active’ nudges represented by health promotion messages installed within the work environment. Elevator availability, the visibility and accessibility of the stairs and pedestrian traffic can influence behavior independently of any intervention (e.g. Eves & Webb, 2006; Olander & Eves, 2011a). Extra-personal barriers may, in part, explain the appreciably weaker effects that occur for interventions in the workplace than for those in public access settings. Further exploration of how passive nudges promoting lift use compete with intervention nudges for stair climbing is also warranted.

Concerning intra-personal factors, participants were well versed about the health and weight loss benefits of regular stair climbing. They also reported that stair climbing made them feel more alert and motivated at work and enabled them to allocate personal time more effectively. Encouragingly, reports here, and objective data elsewhere (see Eves et al., 2006), suggest that stair climbing is a type of physical activity that the overweight find acceptable. Nonetheless perceived social norms at work may dilute the effects of any intervention since embarrassment and social stigma act as a barrier to stair climbing, especially amongst those who are overweight.

Concerning ‘active’ nudges with health promotion messages, it was clear that people are motivated to climb stairs by varied factors such as improving health, losing weight or simply waking oneself up after a period of sitting. Despite this, it was evident that the extended message about heart health was the most effective message across all three campaigns, irrespective of gender and weight status. This result was surprising given that objective measures of stair climbing indicate that the weight control message (OR – 1.52, 95% CI – 1.40 – 1.66) is more effective in the field than the message about heart health (OR – 1.18, 95% CI – 1.09 – 1.27) (see Eves et al., 2006 & Eves et al., 2012). Concerning the heart-themed prompt “*Regular stair climbing gives your heart a workout*”, results suggest that it is more effective for women and the overweight but could be used as part of either a heart health or fitness campaign.

For the weight control campaign, the extended message had greater impacts for women and the overweight; men and those with a BMI < 25 preferred the message about fitness. This is unsurprising; women exercise primarily to lose weight (Garner et al., 1985), whereas men exercise for challenge, competition and to improve strength and endurance (Kilpatrick, Herbert & Bartholomew, 2005). Presumably differences in motivation as a

function of BMI reflect the fact that for heavier individuals losing weight is more important than improving their fitness. With regard to content, providing specific quantifiable information about calorie expenditure was an important part of the extended message, echoing field interview data on the greater motivational value of specific health outcomes (Webb and Eves, 2007). Nonetheless, participants suggested that this information could be improved by illustrating calories using a comparable food item i.e. swapping lbs. of fat for an amount of chocolate or a Big Mac. Selling this sort of message would be difficult; the calorie equivalent of one Big Mac (i.e. 490 Kcals) for an overweight man is 175 flights of stair climbing and participants wanted the benefits gained from stair climbing to outweigh the costs. For these reasons the prompt using an exercise comparator '*stair climbing burns more calories per minutes than jogging*' was particularly encouraging. Not only did it provide an exemplar for calories, but the perceived costs associated with stair climbing were less than those associated with jogging with the added benefit that it burns '*more calories per minute*'. Discussions and descriptive statistics indicated that this prompt was the most effective prompt across all three campaigns.

Overall the fitness theme was the least effective of the three campaigns. Increased rate of respiration and breathing may not be an appropriate target for stair climbing interventions in the workplace given that most people want to avoid getting out of breath at work. Everyone liked the fact that stair climbing is free and accessible and so '*The stairs are your free gym. Why not use them?*' was a universally effective fitness prompt.

Some employers opt not to invest in physical activity promotion, claiming that today's economic climate mitigates the rationale for workplace programs (Goetzel & Ozminkowski, 2008). However, stair climbing itself does not require any specific facilities or equipment, hence set up costs are low, even if one improves the stairwell. Point-of-choice

interventions are also inexpensive; Olander and Eves (2010) estimated a total price of \$31.98 or \$0.05 per employee ( $n=693$ ) working in four buildings. This was echoed by Wu, Cohen, Shi, Pearson and Sturm (2011) who conducted an economic analysis of physical activity interventions and found that the most cost effective strategy was point-of-choice prompts for stair use, with a median cost of \$0.07 per MET hour gained, per day, per person reached. Use of these prompts in public access settings may have a relatively minor effect on population health; choice between the stairs and escalators is a relatively infrequent daily event for most individuals. At work however, employees can accumulate repeated bouts of stair climbing throughout the day, enhancing the attractiveness of this cost effective intervention. Evidently then point-of-choice interventions for stair climbing provide an economically viable approach to increasing physical activity in the workplace.

### *Strength and limitations*

The major strength of this study was the mixed methods approach. Focus groups provided a person orientated methodology which allowed employees to express their thoughts and opinions unconstrained by traditional survey methodology. As a result rich data about employee needs and interests relevant to the development of future interventions were provided. In contrast the scoring exercise allowed us to identify group differences more clearly and rank the messages and prompts in terms their propensity to motivate at work.

Some limitations of the study also warrant consideration. First, reports of external barriers rely on participants' perceptions of their work environment and may differ from objective barriers. They may also differ across samples, population groups or geographic areas. The degree to which the results regarding the extended messages and prompts can be transferred to other contexts or settings also requires further investigation. Additionally, the difficulty in recruiting men, especially those with a BMI > 25, unbalanced the ANOVA

design and limited the generalizability of results from the rating task. Notwithstanding the aforementioned limitations, by employing mixed methods we are, to a certain extent, able to counterbalance the strengths and weaknesses of each approach. Finally, it was not always possible to match scores across campaigns for the same participant based on the verbal data precluding the use of repeated measures ANOVA for theme comparisons.

### *Conclusion*

Stair climbing provides an acceptable method for accumulating physical activity at work, especially for those who are overweight. Intra-personal factors such as health, motivation, perceived social norms and time management influence stair climbing behavior at work. Critically, extra-personal factors associated with the worksite itself, such as the structure and location of the stairs, waiting time for the elevator and pedestrian traffic flow, can also bias a traveler's choice independently of any intervention. It is clear from the qualitative data that people are motivated to climb stairs by different factors. Thus, designing a universally effective intervention for use in the workplace is a challenge; one size does not fit all. For this reason qualitative investigation is essential for developing and refining intervention materials and tailoring components to address individual needs. Despite this, the extended message targeting heart health appears to have the greatest impact on reported propensity to climb the stairs at work, independent of the effects of gender and BMI.

References

- Boreham, C.A.G, Kennedy, R.A., Murphy, M.H., Tully, M., Wallace, W.F.M. and Young, I. (2005). Training effects of short bouts of stair climbing on cardiorespiratory fitness, blood lipids, and homocysteine in sedentary young women. *British Journal of Sports Medicine*, 39, 590-593.
- Brownell, K.D., Stunkard, A. and Albaum, J. (1980). Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry*, 137, 1540-1545.
- Dishman, R.K., Oldenburg, B., O'Neal, H. and Shephard, R.J. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine*, 15(4), 344–361.
- Eves, F., Webb, O., Griffin, C. and Chambers, J. (2012). A multi-component stair climbing promotional campaign targeting calorific expenditure for worksites; a quasi-experimental study testing effects on behavior, attitude and intention. *BMC Public Health*, 12:423. Retrieved 12<sup>th</sup> August 2013 from: <http://www.biomedcentral.com/1471-2458/12/423>
- Eves, F. F., Olander, E. K., Nicoll, G., Puig-Ribera, A. and Griffin, C. (2009). Increasing stair climbing in a train station: the effects of contextual variables and visibility. *Journal of Environmental Psychology*, 29, 300e303.
- Eves, F. F. (2008). All choices are not equal; Effects of context on point-of-choice prompts for stair climbing. *Obesity Reviews*, 9(1), 83-84.
- Eves, F.F. (2010). Effects of point-of-decision prompts for stair use depend on the alternative. *American Journal of Preventive Medicine*, 38, 573–574.

- Eves, F.F., Masters, R.S.W., McManus, A., Leung, M., Wong, P. and White, M.J. (2008). Contextual barriers to lifestyle physical activity interventions in Hong Kong. *Medicine and Science in Sports and Exercise*, 40, 965-971.
- Eves, F. F. and Webb, O. J. (2006). Worksite interventions to increase stair climbing; Reasons for caution. *Preventive Medicine*, 43(1), 4-7.
- Eves, F. F., Webb, O. J. and Mutrie, N. (2006). A workplace intervention to promote stair climbing: Greater effects in the overweight. *Obesity* 14(12), 2210-2216.
- Garner, D. M., Rockert, W., Olmstead, M. P., Johnson, C. and Coscina, D. V. (1985). Psycho-educational principles in the treatment of bulimia and anorexia nervosa. In D. M. Garner and P. E. Garfinkel (Eds.), *Handbook of psychotherapy for anorexia nervosa and bulimia*. New York: Guilford.
- Glaser, B.G. (1965). The Constant Comparative Method of Qualitative-Analysis. *Social Problems*, 12(4), 436-45.
- Goetzel, R.Z. and Ozminkowski, R.J. (2008). The health and cost benefits of work site health promotion programs. *Annual Review of Public Health*, 29, 303–323.
- Haskell, W. L., Lee, I., Pate, R. R., Powell, K.E., Blair, S.N., Franklin, B.A., Macera, C. A., Heath, G.W., Thompson, P.D. and Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116, 1081-1093
- Kerr, J., Eves, F. F. and Carroll, D. (2001a). The influence of poster prompts on stair use: The effects of setting, poster size and content. *British Journal of Health Psychology*, 6(Part 4), 397-405.



Kerr, J., Eves, F. F. and Carroll, D. (2001b). Can posters prompt stair use in a worksite environment?

*Journal of Occupational Health, 43*(4), 205-207.

Kerr, J., Eves, F. F. and Carroll D. (2001c). Six-month observational study of prompted stair

climbing. *Preventive Medicine, 33*, 422-427.

Kilpatrick, M., Herbert, E. and Batholomew, J. (2005). College students' motivation for physical activity: Differentiating men and women's motives for sport participation and exercise.

*Journal of American College Health, 54*, (2), 87 – 94.

Kremers, S.P.J., Eves, F.F. and Andersen, R.E. (2012). Environmental changes to promote physical activity and healthy dietary behavior. *Journal of Environmental and Public Health, Vol 2012*,

*Article ID 470858*, 1-4.

Lee, I.M. and Paffenbarger, R.S. Jr. (1998). Physical activity and stroke incidence: the Harvard

Alumni Health Study. *Stroke, 29*, 2049-54.

Levine, J.A. and Kotz, C.M. (2005) NEAT – non-exercise activity thermogenesis – egocentric and geocentric environmental factors vs. biological regulation. *Acta Physiologica Scandinavica*,

184, 309-318

Lewis, A. L. and Eves, F.F. (2012). Testing the theory underlying point of choice prompts: A multi-component stair climbing intervention. *Psychology of Sport and Exercise, 13*, 126-32.

Lewis, A. L. and Eves, F.F. (2011). Specific effects of a calorie-based intervention on stair climbing in overweight commuters. *Annals of Behavioral Medicine, 42*(2), 257-61.

- Marshall, A. L., Bauman, A. E., Patch, C., Wilson, J. and Chen, J. (2002). Can motivational signs prompt increases in incidental physical activity in an Australian health-care facility? *Health Education Research*, 17(6), 743-749.
- Meyer, P., Kayser, B., Kossovsky, M.P., Sigaud, P., Carballo, D., Kaller, P.F., Martin, X.E., Farpour-Lambert, N., Pichard, C. and Mach, F. (2010). Stairs instead of elevators at workplace: cardioprotective effects of a pragmatic intervention. *European Journal of Cardiovascular Prevention and Rehabilitation*, 17(5), 569-575.
- Meyers, A. W., Stunkard, A. J., Coll, M. and Cooke, C. J. (1980). Stairs, escalators, and obesity. *Behavior Modification*, 4(3), 355-359.
- NHS Health Scotland. (2004). Pre-testing of stair climbing resources. A report by Scott Porter Research, April 2004. Edinburgh: NHS Health Scotland.
- National Institute for Clinical Excellence. (2008). *Workplace health promotion: How to encourage employees to be physically active*. National Institute for Clinical Excellence, London.
- Nocon, M., Müller-Riemenschneider F., Nitzschke, K. and Willich, S.N. (2010) Increasing physical activity with point-of-choice prompts – a systematic review. *Scandinavian Journal of Public Health*, 38, 633-638.
- Olander, E.K. and Eves, F.F. (2011a) Effectiveness and cost of two-stair climbing interventions – less is more. *American Journal of Health Promotion*, 25, 231-236.
- Olander, E. and Eves, F.F. (2011b) Elevator availability and its impact on stair use in a workplace. *Journal of Environmental Psychology*, 31, 200-206.

- Paffenbarger, R. S., Hyde R.T., Wing, A.L. and Hsieh, C.C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine*, 314, 605-13.
- Sallis, J.R., Cavereo, R.B., Ascher, W., Henderson, K.A. and Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health*, 27, 297-322.
- Soler, R.E., Leeks, K.D., Ramsay Buchanan, L., Brownson, R.C., Heath, G.W. and Hopkins, D.H. (2010). Point-of-decision prompts to increase stair use: A systematic review update. *American Journal of Preventive Medicine*, 38(2S), S292-S300.
- Teh, K. C. and Aziz, A. R. (2002). Heart rate, oxygen uptake, and energy cost of ascending and descending the stairs. *Medicine and Science in Sports and Exercise*, 34(4), 695-699.
- Webb, O. J. and Eves, F. F. (2005). Promoting stair use: Single versus multiple stair riser messages. *American Journal of Public Health*, 95(9), 1543-1544.
- Webb, O.J., and Eves, F.F. (2007) Promoting stair use: effects of message specificity and validation. *Health Education Research*, 22, 29-57.
- Wu, S., Cohen, D., Shi, Y., Pearson, M. and Sturm, R. (2011). Economic analysis of physical activity interventions. *American Journal of Preventive Medicine*, 40(2), 149-158.

**Box 1. Messages and Prompts to Increase Stair Climbing at Work**

**Weight control** Stair climbing always burns calories. One flight of stairs uses about 2.8 calories, but 10 flights a day would use 28 calories. Over a year that adds up to more than 10,000 calories. That’s about 3lbs of fat.

Stair climbing always burns calories

**Exemplar for calories** Stair climbing burns more calories per minute than jogging

**Fitness** Climb two flights of stairs in one go. If you feel slightly out of breath that’s because you’ve started to get fitter.

The stairs are your free gym, Why not use them?

**Heart health** Doctors have found that 7 minutes of stair climbing a day halves your risk of a heart attack over a 10 year period. There are 1440 minutes in a day. Can you spare 7 to live longer?

Stair climbing gives your heart a workout. Why don’t you try it?

*Table 1. Breakdown of participants by focus group*

<b>Focus group</b>	<b>N</b>	<b>Gender</b>	<b>Age (Mean)</b>	<b>BMI (Mean)</b>
1	6	Male	25 – 42 (33.2)	18.0 – 24.6 (22.7)
2	6	Female	24 – 61 (46.8)	21.8 – 24.9 (23.8)
3	6	Male	42 – 55 (48.3)	21.3 – 24.7 (23.3)
4	6	Female	30 – 42 (37.4)	23.0 – 24.7 (24.2)
5	6	Female	24 – 53 (40.5)	20.5 – 24.9 (23.2)
6	6	Female	31 – 47 (36.0)	20.4 – 24.7 (22.3)
7	5	Female	18 – 58 (42.2)	25.1 – 36.7 (30.1)
8	6	Female	34 – 56 (44.3)	25.2 – 28.2 (26.6)
9	8	Female	27 – 56 (41.0)	25.1 – 45.0 (31.5)
10	4	Male	27 – 48 (34.3)	26.0 – 27.7 (26.9)

Table 2a. *Mean Motivation Scores and (Standard Deviation) for the weight control message and prompts*

Message/Prompt	Gender		Weight status		Gender*Weight status			Total	
	Men	Women	BMI	BMI	Men	Women	Men		Women
			< 25	> 25	< 25	< 25	> 25		> 25
Weight control	2.22 <	3.16	2.63 <	3.25	1.79 <	3.50	3.13	3.19	2.88
(Message)	(1.11)	(0.72)	(1.02)	(0.70)	(0.89)	(0.58)	(0.72)	(0.73)	(0.95)
Calories	2.46 <	3.96	3.02 <	4.16	2.25	3.00	3.47	4.42	3.53
(Prompt)	(1.10)	(1.11)	(1.30)	(0.98)	(0.95)	(1.41)	(1.29)	(0.67)	(1.26)
Jogging	3.89	4.33	3.58 <	4.66	3.60	3.56	4.67	4.63	4.18
(Prompt)	(0.68)	(0.87)	(0.81)	(0.45)	(0.52)	(1.12)	(0.45)	(0.48)	(0.83)

< Denotes a significant difference between groups in each category

Table 2b. *Mean Motivation Scores and Standard Deviation for the fitness message and prompts*

Message/Prompt	Gender		Weight status		Gender*Weight status			Total	
	Men	Women	BMI	BMI	Men	Women	Men		Women
			< 25	> 25	< 25	< 25	> 25		> 25
Fitness	2.60	2.96	3.07	2.68	2.50	2.75	3.28	2.67	2.88
(Message)	(0.32)	(1.00)	(0.64)	(1.09)	(0.00)	(0.50)	(0.63)	(1.19)	(0.90)
Free gym	3.46	4.03	4.10	3.63	4.06	4.12	2.25	3.92	3.89
(Prompt)	(1.05)	(0.83)	(0.72)	(1.06)	(0.62)	(0.50)	(0.77)	(0.90)	(0.91)

Table 2c. Mean Motivation Scores and Standard Deviation for the heart health message and prompt

Message/Prompt	Gender		Weight status		Gender*Weight status			Total	
	Men	Women	BMI	BMI	Men	Women	Men		Women
			< 25	> 25	< 25	< 25	> 25		> 25
Heart health	3.46	3.89	3.63	4.02	3.44	3.50	3.70	4.13	3.79
(Message)	(0.78)	(0.94)	(0.80)	(1.03)	(0.73)	(1.00)	(0.84)	(1.03)	(0.92)
Heart (Prompt)	2.50 <	3.76	2.96 <	3.95	2.06	3.50	3.44	4.06	3.42
	(1.08)	(1.05)	(1.23)	(0.90)	(0.81)	(1.00)	(1.16)	(0.87)	(1.19)

< Denotes a significant difference between groups in each category