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Likening stairs in buildings to climbing a mountain: Self-reports of expected effects on stair climbing and objective measures of effectiveness

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ABSTRACT

Objectives: Health promotion agencies advocate use of mountain climbing goals to encourage regular stair climbing, a current public health target. This paper tests effects of a mountain climbing campaign on objective measures of stair use for the first time.
Design: Field interview and quasi-experimental, interrupted time-series study.
Method: In field interviews, a convenience sample (n = 1350) responded to questions about different goals, i.e., heights of climb, to encourage stair use in buildings. Subsequently, a point-of-choice intervention with the main message 'Take the stairs to the top of this building once a day and in a year, you would have climbed Mount Everest almost twice' was tested in a 12-floor worksite. A no-message baseline was followed by installation of the intervention.
Results: Stair ascent (n = 62,716) and descent (n = 61,218) at the ground floor was measured with automated counters at baseline (11 days) and during the intervention (18 days). The majority of interviewees (60%) chose a message based on climbing Mt. Everest as the most motivating, with only 5% of interviewees not motivated by any climbing goal. Nonetheless, the subsequent intervention using the mountain climbing goal had no effect on stair climbing (OR = 0.96). As the campaign specifically targeted stair ascent, it failed to influence the behaviour with the greater public health dividend.
Conclusion: The discrepancy between pre-testing and the campaign may reflect the fact that performance goals can only be achieved at the end of the task and may not be continually rewarded during accumulation of behaviour towards the goal.

Physical activity conveys a range of benefits, with proven effects on risks for cardiovascular disease, diabetes and cancer (Department of Health, 2005, UK). Nonetheless, the populations of industrialised nations do not perform sufficient physical activity to accrue these benefits; it has been estimated that 52% and 68% of the populations in the US and UK are insufficiently active (Department of Health, 2005; Haskell et al., 2007). Current physical activity recommendations recommend a minimum of 30 min of at least moderate intensity physical activity on five or more days of the week. In addition, physical activity can be accumulated throughout the day (Department of Health, 2005; Haskell et al., 2007). Climbing the stairs rather than using the escalator or lift is one means of increasing lifestyle activity. Indeed, regular stair climbing can increase cardiovascular fitness, improve lipid profiles and reduce both body fat and the risk of osteoporosis (Boreham, Wallace, & Nevill, 2000; Boreham et al., 2005; Kerr, Eves, & Carroll, 2001a). These benefits reflect the fact that stair climbing is physiologically vigorous exercise, being more intense than jogging (8.6–9.6 METs: Bassett et al., 1997; Teh & Aziz, 2002).

Recent approaches to physical activity promotion include a broader range of potential influences than traditionally studied intra-individual processes. Ecological frameworks consider how physical and social environments, in addition to individual factors, influence physical activity (Giles-Corti & Donovan, 2003; Saelens & Handy, 2008; Sallis et al., 2006; Sallis, Frank, Saelens, & Kraft, 2004). For example, proximity to utilitarian destinations and mixed usage of urban environments have been associated with walking (McCormack, Giles-Corti, & Bulsara, 2008; Saelens & Handy, 2008), as have supportive social partners (Giles-Corti & Donovan, 2003). Similarly, stair use has been related to the layout of the built environment (e.g., Eves, Olander, Nicoll, Puig Ribera, & Griffin, 2009) and the movement of pedestrians within it (Eves et al., 2009; Olander & Eves, 2011a; Webb, Eves, & Smith, 2011a). Interventions for stair climbing are an example of active environmental changes aiming to

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increase lifestyle physical activity. For a typical stair climbing intervention, a poster is positioned at the 'point-of-choice' between the stairs and an escalator encouraging travellers to use the stairs for the benefit of their health. Despite consistent success with this approach on public access staircases (see Eves, 2008; Eves et al., 2008; Eves, 2010; Nocon, Müller-Riemenschneider, Nitzschke, & Willich, 2010), a single bout of stair climbing on such a staircase is unlikely to produce significant public health gains. Rather, regular stair climbing is required. One context in which regular stair climbing can be targeted is the workplace. Most adults spend half their waking hours at work (Kerr, Eves, & Carroll, 2001b) and many workplaces offer a choice between stairs and a lift to move between floors. Further, individuals can accumulate stair climbing in short bouts throughout the day reducing the temporal burden of increased physical activity. Thus, regular stair climbing at work is a plausible goal. Despite this, attempts to translate successful interventions for stair climbing on public access staircases to worksites have been problematic (Eves & Webb, 2006). For the public access settings involving choice between stairs and an escalator, the overall average increase for stair climbing is +5.9%. In contrast, when pedestrians choose between stairs and a lift, the usual choice in a worksite, the increase for stair use is only +0.1% (see Eves, 2010; Nocon et al., 2010; Soler et al. 2010). Hence, ways to successfully intervene for stair climbing in worksites are an important step towards the public health goal of increased lifestyle physical activity. Part of this failure to successfully increase stair climbing in worksites may reflect uncontrolled effects of lift availability (Olander & Eves, 2011a). Additionally, messages to encourage stair climbing are often freely generated by researchers without any pre-testing such that the optimal messages may not have been employed in some studies (Webb & Eves, 2007a). Therefore, we presage the intervention we test with a formal pre-testing phase of possible messages.

One possible approach to encouraging regular stair climbing is to liken the behaviour to climbing a mountain; *regular* use of the stairs would be required to achieve any mountain climbing goal. For example, an early report by Knadler and Rogers (1987) encouraged stair climbing in a worksite by a competition amongst employees to climb a virtual mountain peak of 2417 feet; 200 flights of stairs in a month would achieve this goal (Knadler & Rogers, 1987). Incentives of entry in a prize draw for a 35 mm camera, public praise on bulletin boards, prompt cues and congratulation cards were employed. Around one third of the workforce reported achieving this goal, suggesting the mountain climbing approach may be an effective motivator. Since Knadler and Rogers paper, many public health agencies have included mountain climbing components in their stair climbing resources. Thus 'StairWELL to Better Health' in the US (Centres for Disease Control, 2009), 'Stairway to Health' campaigns in Canada (British Columbia Ministry of Health, 2005), the 'Everest Challenge' in the UK (Sport England, 2009) and 'Climb to the top' in Australia (Bauman, Bellew, Vita, Brown, & Owen, 2002) all aim to encourage stair use by climbing a mountain peak or a high building. In essence, these campaigns use a performance goal, i.e., reaching the summit of a mountain, rather than a goal based on health outcomes such as improved cardiovascular health. Additionally, incentives or elements of competition are included to encourage participation in the challenge.

Despite the apparent popularity of a mountain climbing approach to public health agencies, formal evaluations are rare. Apart from the original report from Knadler and Rogers (1987), we could only find a brief summary of a campaign trialled in the British Columbia Ministry of Health building, Canada. In this campaign, a virtual climb to the top of CN tower, the tallest free standing structure in the Americas (553.3 m) successfully increased stair climbing whereas a repeat challenge involving Mt. Everest did not (British Columbia Ministry of Health, 2005). As both campaigns involved an element of competition between teams, however, it is unclear whether the effects of the climbing goal itself were confounded with competition and the social interaction involved in team pursuit of the goal. It should be noted that the use of incentives, social competition and interaction would all require organisation by any worksite. As costs and resources are barriers to implementation of health promotion for businesses (Rogers, Wright, Evans, & Williams, 2008), use of additional elements to a climbing goal would not have universal appeal. In this test of a campaign based on a mountain climbing goal, we do not include additional elements of incentives, competition or social interaction.

In this paper we report the results of two studies. First, structured interviews pre-tested the potential of different climbing goals alone to encourage stair climbing. Four different heights of climb were tested. In observational studies, women, the old, overweight individuals and ethnic minorities are less likely to climb stairs than their comparison groups (e.g., Brownell, Stunkard, & Albaum, 1980; Eves, Webb, & Mutrie, 2006; Kerr et al., 2001a; Webb & Eves, 2007b; Webb, Eves, & Kerr, 2011b). Additionally, age and gender may moderate responses to stair climbing interventions in public access settings (Webb et al., 2011b). Hence, we assessed potential effects of these demographics, as well as self-reported categorisation of current activity level using Stage of Change for physical activity, on choice of goal. Stage of Change categorises individuals on a continuum from not even considering a change in their physical activity (pre-contemplation) through active contemplation of change (contemplation, preparation) to having achieved the target behaviour for over six months (maintenance; see Laforge, Velicer, Richmond, & Owen, 1999). Here, we tested whether individual's categorisation of their levels of physical activity might affect choice of campaign message. In the absence of previous information, we made no *a priori* predictions about potential effects of any demographic grouping. Subsequently, we tested a worksite campaign based on the most popular climbing goal from the interviews, namely Mt. Everest, using an objective measure of stair use. For this second study, we assessed uncontrolled factors that can dilute effects of a campaign in worksites. As noted earlier, social environments can influence stair climbing. The number of people in the building at any point in time, termed *building occupancy*, biases behaviour towards stair use, whereas minute-by-minute pedestrian traffic at the point-of-choice and time of day can bias behaviour away from stair use (Olander & Eves, 2011a). Hence these factors were included in analyses. We predicted increased use of stairs with increased building occupancy whereas we predicted reduced stair usage with increased pedestrian traffic and time of day. On the basis of positive results in pre-testing, we predicted an increase in stair climbing after installation of the intervention.

Method

Campaign pre-testing

Participants and procedure

The studies reported in this paper were approved by the School of Sport and Exercise Sciences Ethics Subcommittee at the University of Birmingham. Members of the public ($n = 1350$) completed a structured interview by a large civic 6-floor building in a public square in the West Midlands, UK. First, participants indicated the message most likely to encourage them to climb the stairs to the top of the building from four different alternative statements. The choice of alternatives varied the final height of the goal and, as a consequence, the time taken to achieve it. Potential campaigns proposed by public health agencies include both mountains, e.g., Mt. Everest, and buildings, e.g., CN tower, with variation in the