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Abstract

Objective - Stair-riser banners are twice as effective as posters in encouraging stair climbing in shopping centres. This study tested the effectiveness of stair-riser banners in an English train station in 2006-2007.

Method - The train station had a 39-step staircase and an adjacent escalator. Baseline observations (3.5 weeks) were followed by 10.5 weeks of a banner intervention supplemented with 3 weeks of a poster intervention. Both poster and banner featured the message 'Stair climbing burns more calories per minute than jogging. Take the stairs'. Ascending escalator and stair users (N=36,239) were coded for gender.

Results - Analyses, controlling for effects of gender and pedestrian traffic volume, revealed no significant change in stair climbing between baseline (40.6%) and the banner intervention (40.9%; $p=0.98$). Addition of the poster increased stair climbing (44.3%; OR= 1.36, 95% CIs 1.16-1.60, $p< 0.001$), with the effect reduced at higher pedestrian traffic volumes.

Conclusion - While stair-riser banners had no effect, the poster intervention increased stair climbing. The high pedestrian volumes as the wave of disembarking passengers seek to leave the station would have obscured the visibility of the banner for many commuters. Thus stair-riser banners appear unsuitable point-of-choice prompts in stations where pedestrian traffic volume is high.

Introduction

Stair climbing has been associated with many health benefits, including increased fitness and reduced low density lipoprotein (Boreham et al, 2005). Stair climbing is readily accessible, free and easily accumulated into an individual's life. To encourage stair climbing, both stair-riser banners and posters have been consistently successful in public access staircases (Blamey et al, 1995; Brownell et al, 1980; Kerr et al, 2000, 2001a, 2001b, 2001c; Webb & Eves, 2005, 2007). Further, a systematic comparison in two shopping centres showed that banners increased stair climbing twice as much as posters (Kerr et al, 2001a). This superiority of stair-riser banners reflects their greater visibility (Webb & Eves, 2005). Thus almost 80% of interviewees reported seeing the banners (Kerr et al, 2001b; Webb & Eves, 2005, 2007), whereas only 36.9% reported seeing a poster (Kerr et al, 2000). Additionally, stair-riser banners are visible for longer than a poster as pedestrians who chose the escalator are still exposed to the message (Kerr et al, 2001b). Taken together it is not surprising that past studies have recommended the use of stair-riser banners rather than posters for public access staircases (Kerr et al, 2001b).

While previous successful studies using stair-riser banners have been conducted in shopping centres, train stations represent a test of the generality of the superiority of banners over posters. In a train station, pedestrian traffic volume can be high, and it is possible that high rates of pedestrian traffic may impact on the visibility of stair-riser banners. This study examined the effects of stair-riser banners and a poster in a busy train station.

Methods

The study was granted ethics approval from the University of Birmingham. The train station had a 39-step staircase and an adjacent escalator. Four observers (inter-observer agreement kappa range .85-.94) recorded stair/escalator choices of ascending travellers, between 8.15 and 9.45 am, for two days a week. Travellers accompanied by children (head below shoulder height of accompanying adult) or those carrying large bags were discarded. In a quasi-experimental interrupted time series design, 3.5 weeks of baseline was followed by 10.5 weeks of stair-riser banners with the message 'Stair climbing burns more calories per minute than jogging. Take the stairs'. As a means of comparing the effectiveness of different formats, the banner intervention was supplemented with three further weeks of an A1 poster positioned at the foot of the stairs containing the same message.

During the two intervention phases, pedestrians were randomly approached following ascent and asked if they had seen the banner (n=81, 41% escalator users, 48% women) or if they had seen the poster (n=105, 42% escalator users, 43% women).

Statistical analyses

Logistic regression analyses were conducted with escalator/stair use as the dependent variable and gender and intervention as dichotomous predictor variables. Pedestrian traffic volume, i.e. the number of pedestrians leaving each train, was entered as a continuous variable. Follow-up logistic regression analyses used the same procedure.

Results

A total of 36,239 pedestrians were coded (56.4% females). Logistic regression analysis revealed no significant difference between baseline (40.6% stair climbing) and the banner intervention phase (40.9% stair climbing; see table 2.1). In contrast, stair climbing significantly increased when the poster was added to the intervention (44.3% stair climbing). Further, a significant interaction between pedestrian traffic volume and the poster phase reflected the fact that the intervention effects were reduced at higher traffic volumes. In addition, overall more men used the stairs than women and stair climbing was greater at higher traffic volumes ($p < .001$). Follow-up linear regression revealed that on average the overall effect of an additional pedestrian increased the rate of stair climbing by 0.2%. There was no significant change in the effect of the poster intervention over successive weeks (odds ratio [OR] = 0.97, 95% confidence intervals [CIs] = 0.92-1.03, $p = .31$).

Follow-up exploratory analyses of the banner phase tested for a level of pedestrian traffic volume at which the intervention was effective in this context. With traffic levels for each train below 90, there was a significant effect of the banner intervention (OR = 2.30, CIs = 1.09-4.84, $p = .03$) and a significant interaction between the intervention and traffic volume (OR = 0.98, CIs = 0.97-0.99, $p = .04$) reflecting reduced effectiveness at higher volumes. For pedestrian traffic volumes above 90 for each train, however, there was no effect of the banner intervention (OR = 0.98, CIs = 0.93-1.04, $p = .53$).

	Banner phase (compared to baseline) n=27,558		Banner and poster phase (compared to banner alone) n=26,225	
	OR	95% CIs	OR	95% CIs
Intervention	1.001	0.952-1.052	1.363***	1.164-1.596
Men>Women (56.4% women)	1.190***	1.133-1.249	1.157***	1.101-1.215
Pedestrian traffic (range 4-372)	1.002***	1.002-1.002	1.002***	1.001-1.002
Pedestrian traffic x Intervention	ns	n/a	0.999*	0.998-1.000

*p<.05; ***p<.001

Table 2.1 Odds ratios (OR) and confidence intervals for stair use divided into the different intervention phases (N=36,239).

Analyses of the interviews revealed reduced banner visibility in this study (35.8%) compared to previous research (78.3%-80%; $\chi^2 = 77.18$, $p < .001$; Kerr et al, 2001b; Webb & Eves, 2005, 2007). While poster visibility (41%) was no greater than banner visibility, it was comparable to reported visibility of a poster in a previous successful intervention (36.9%; $\chi^2 = .62$, $p = .43$; Kerr et al, 2000). Nonetheless, the modest, non-significant increase in reported visibility of the poster relative to the banner (+5.2%) was similar to the increase in stair climbing when it was installed (+3.4%).

Discussion

This is the first study that has attempted to encourage stair climbing with stair-riser banners in a train station. In direct contrast to previous research, (Kerr et al 2001b, 2001c; Webb & Eves, 2005, 2007) the banners did not change behaviour. Addition of a conventional poster intervention, however, produced the expected increase in stair climbing. The commuter train station here (966 pedestrians.hr⁻¹) was busier than previous shopping mall sites where banners have been used in our own work (n=226,263: sample size weighted average = 592 pedestrians.hr⁻¹). Further, pedestrian traffic in stations typically involves disembarking passengers seeking to leave the station at the same time. It seems likely that the initial wave of pedestrians reaching the stairs obscured the view of the banners from those following. The impaired visibility is supported by the interview data; only 35.8% of commuters saw the banner, a much lower value than the approximate 80% of pedestrians reporting seeing the banner in previous successful studies (Kerr et al, 2000; Webb & Eves 2005, 2007). When the poster was introduced, stair climbing increased in line with previous research (Blamey et al, 1995; Brownell et al, 1980; Iversen et al, 2007; Kerr et al, 2000; Kerr et al 2001a).

Pedestrian traffic volume affected stair climbing as reported previously (Kerr et al, 2001a, 2001b, 2001c, Webb & Eves 2005, 2007); that is greater stair use occurred at higher

traffic volumes. It appears that pedestrians will choose the stairs to leave the station when their access to the escalator is blocked. In addition, the interaction between the poster intervention and pedestrian traffic volume revealed an apparent reduction in the effects of the intervention at higher volumes. As a consequence, failure to include pedestrian traffic volume in modelling may underestimate the success of any intervention in busy train stations.

Study limitations and strengths

A possible limitation of this study is that only one train station was used and the effect may be station-specific. Indeed, pedestrian traffic volume here ($966 \text{ pedestrians.hr}^{-1}$) was at the high end of the published range ($131 - 993 \text{ pedestrians.hr}^{-1}$), with only Iversen et al., (2007) reporting higher rates ($993 \text{ pedestrians.hr}^{-1}$ in the Østerport station). While follow-up analyses suggested effects of the banners when pedestrian traffic levels were below 90 passengers per train, such a level of traffic was rare in this busy station. Pedestrian numbers below 90 occurred on only 9.4% of the observations. This paucity of low traffic precluded formal analyses stratified by pedestrian traffic volume that might have been informative; the imbalance in statistical power between high and low traffic samples would have compromised the relative precision of any estimates. Additionally, without a control station that lacked the intervention, the efficacy of the intervention cannot be accurately measured. One of the strengths of this study was the extended banner intervention phase (10.5 weeks) which allowed sufficient time to test the effectiveness; the longest previous intervention in a train station was 3 weeks (Blamey et al, 1995; Brownell et al, 1980). Further, we experimentally tested the visibility explanation for lack of effectiveness of the banners by adding a clearly visible poster intervention and follow-up analyses revealed that the banners were effective when traffic volume was relatively low. In a setting where traffic was at

similar levels, however, it is possible that the combination of stair-riser banners and a poster could produce a greater effect than a poster alone.

Conclusions

In conclusion, banner interventions affixed to the stair-risers may be ineffective in busy settings where their visibility may be obscured. For train stations, the wave of disembarking passengers trying to leave the station simultaneously means that those climbing the stairs first can obscure visibility of the banners for passengers following behind. The amount of impaired visibility for high levels of pedestrian traffic is likely to be site specific and the pulsatile nature of pedestrian traffic in train stations may make them particularly vulnerable. Consequently, stair-riser banners will not be suitable point-of-choice prompts for stations in which pedestrian traffic volume is high.

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