ORIGINAL RESEARCH ARTICLE

Are point-of-decision prompts in a sports science and medicine centre effective in changing the prevalence of stair usage? A preliminary study

Julian D Pillay (MPH)[1,2]
Tracy Kolbe-Alexander (PhD)[1]
Masturah Achmat (BSc Hons (Biokinetics))[1]
Madelaine Carstens (BSc Hons (Dietetics))[1]
Estelle V Lambert (PhD)[1]

[1]UCT/MRC Research Unit for Exercise Science and Sports Medicine, Faculty of Health Sciences, University of Cape Town

[2]Department of Basic Medical Sciences, Faculty of Health Sciences, Durban University of Technology

Abstract

Objective. To determine the impact of a signed intervention on promoting stair versus lift usage in a health and fitness facility.

Design. A 3-week observational study in which a simple time-series design of collecting data before, during and after the introduction of an intervention was used.

Setting. The Sports Science Institute of South Africa (SSISA): a 5-storey building with a centrally located lift lobby and internal stairwell.

Method. Observers were placed unobtrusively on the ground floor, with good visibility of lift/stairwell, to observe ascending movement of students, staff, tenants, visitors and patients 4 hours/day (07h00 - 09h00, 16h00 - 18h00), 4 days/week for 3 weeks. During week 2, motivational signs were displayed on the wall next to the lift and stairs and on the floor leading to the stairwell. In week 3, signage was removed. Factors considered in predicting stair use were gender, phase of intervention, and whether persons were staff/students or visitors.

Results. A total of 4 256 person-counts were recorded. Prevalence of stair use increased from 43% before the intervention to 53% during the intervention to 50% after the intervention. Odds of using the stairs during the intervention increased by 45% (odds ratio (OR) 1.45, 95% confidence interval (CI) 1.25 - 1.68) (p<0.00001), were 41% higher for staff/students compared with visitors (p<0.00001) and were 55% greater for women (p<0.00001). These effects did not change significantly after the intervention and stair use remained modestly higher than before the intervention.

Conclusion. Signed intervention produced significant increases in stair usage during and after the intervention. These findings support the effectiveness of point-of-decision prompts for changing behaviour, and highlight potential factors influencing the impact of such messages.

CORRESPONDENCE:

Julian D Pillay
Department of Basic Medical Sciences
Faculty of Health Sciences
Durban University of Technology
PO Box 1334
Durban 4000
South Africa
Tel.: +27 31 3732398
Fax: +27 866 741067
E-mail: pillayjd@dut.ac.za

Introduction

Physical activity is recognised as a central component of overall approaches to primary prevention in reducing morbidity and mortality and improving well-being.[1] However, current societal trends have led to decreases in energy expenditure.[2] Encouraging the sedentary person to be more active is a public health priority and the health promotion agenda for the 21st century includes promoting incidental physical activity as part of an overall plan for active living.[3] Therefore, the current emphasis in physical activity promotion is on the accumulation of lifestyle activity.[4-6]

Consistent with the current recommendations for physical activity, people should be encouraged to accumulate physical activity throughout the day.[7] Even small amounts of activity may lead to the accumulation of an adequate level of energy expenditure over the course of the day.[8] An option easily accessible and feasible to most people for accumulating incidental physical activity is the use of stairs instead of an escalator or lift, particularly in an occupational setting where there are likely to be multiple trips during the day.

Stair climbing is a physiologically vigorous physical activity shown to require 8.6 times more energy expenditure than the resting state.[9] Regular stair climbing also has well-documented health dividends such as increased fitness and strength, weight loss, improved lipid profiles and reduced risk of osteoporosis.[10] In addition, stair climbing is free and readily available to most people. Most studies that have attempted to increase the use of stairs compared with an

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TABLE I. Summarised counts of study

	Pre-intervention (lift)	Pre-intervention (stairs)	Intervention (lift)	Intervention (stairs)	Post-intervention (lift)	Post-intervention (stairs)
ESSM (males)	75 (56%)	58 (44%)	56 (30%)	129 (70%)	62 (43%)	81 (57%)
ESSM (females)	58 (45%)	70 (55%)	65 (34%)	127 (66%)	53 (40%)	81 (60%)
Non-ESSM (males)	287 (60%)	190 (40%)	346 (51%)	327 (49%)	267 (53%)	242 (48%)
Non-ESSM (females)	277 (56%)	214 (44%)	373 (52%)	345 (48%)	252 (53%)	221 (47%)
Total	697 (57%)	532 (43%)	840 (48%)	928 (52%)	634 (50%)	625 (50%)
(*N*=4 256)	1 229 (100%)		1 768 (100%)		1 259 (100%)	

escalator/lift have been successful.[11-22] Few studies report lack of improvement during and/or after an intervention.[23,24] A more recent form of health promotion is emphasis on the use of point-of-choice prompts to encourage stair climbing in the workplace.[5,25]

The aim of this study was to assess the effectiveness of a signed intervention to promote the use of stairs in a health and fitness facility which ultimately encouraged students, staff and visitors to increase their level of incidental physical activity.

Method

Formative work

Before the start of this study, focus group discussions were conducted at the Sports Science Institute of South Africa (SSISA). These discussions were conducted among students and staff to determine the perceptions around health, fitness and behavioural patterns in terms of incidental physical activity such as stair usage. E-mails were sent to students and staff, inviting them to attend a focus group discussion, with available time slots indicated. Two focus group discussions were conducted with 5 participants and 2 facilitators at each session, one facilitating discussion and the other scribing. The entire discussion lasted approximately 30 minutes and was recorded by means of an audiotape. Facilitating factors and barriers to stair usage and willingness to change behaviour towards accumulating incidental physical activity such as stair usage were also discussed. The outcome of this phase of the study provided input towards the development of the intervention programme.

Intervention programme and observation procedure

In the 3-week observational study, a simple time-series design of collecting data before, during and after the introduction of an intervention was used. The first phase of the study was the pre-intervention phase, the second was the intervention phase and the third was the post-intervention phase. Each of the phases was conducted on the same days of the week (Tuesday - Friday) and at the same time (07h00 - 09h00 and 16h00 - 18h00). Data were recorded by a researcher who counted 'people movements' up the stairs or into the elevators. The researcher was positioned in the kiosk area on the ground floor of the building in an unobtrusive manner, but such that good visibility of lift/stair users was maintained at all times. The directional measure was important since the energy cost of ascending stairs is approximately 3 times that of descending stairs.[9] Before the study it was decided that only ascending movement will be recorded. The intervention materials were displayed during week 2 of the study. The intervention consisted of coloured signs (21 cm x 30 cm) mounted on the wall next to the elevator and stair areas (Fig. 1), and coloured, vinyl footprints stuck on the floor, which led people to the stairs.

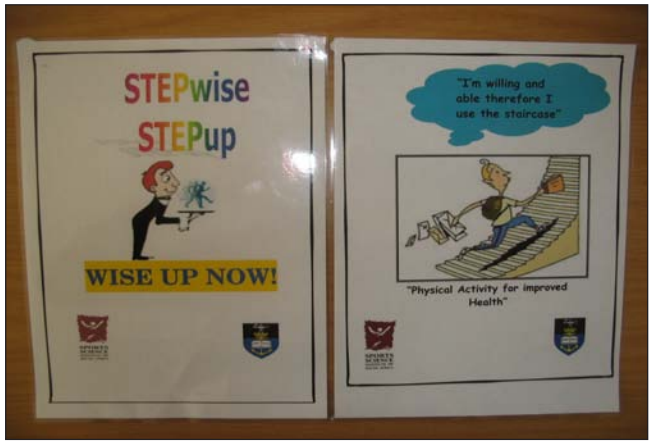

Fig. 1. Message displayed in signage.

Such signage aimed to provide a 'point of choice' motivational prompt to encourage staff and visitors to use the stairs as an alternative to the elevator to improve their health and fitness.[24]

Observational data collected by the researcher during the days and times specified were transformed into a percentage of number recorded and were subdivided into exercise science students/staff member (ESSM) and non-exercise science students/staff member (non-ESSM). The data were further stratified into gender-specific categories.

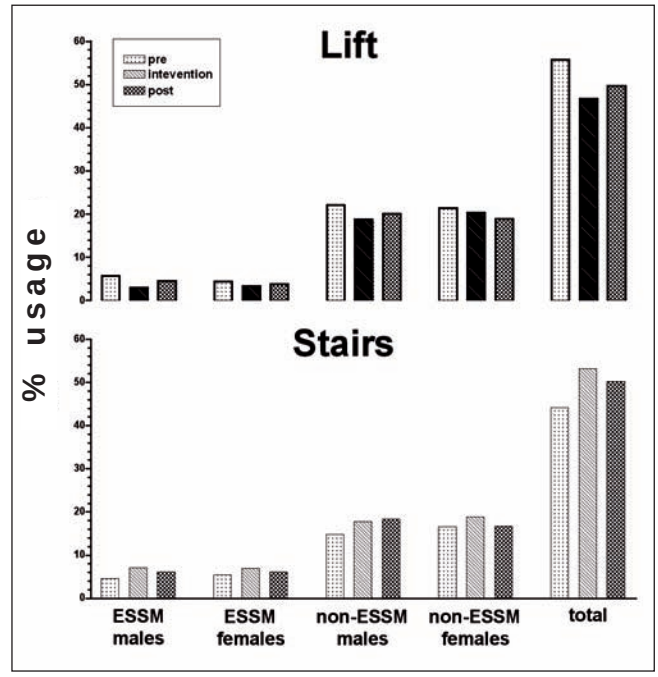

Fig. 2. Comparative display of lift/stair usage at SISSA before, during and after the intervention.

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The data were analysed using STATISTICA version 7 (StatSoft Inc., Tulsa, OK, USA). Logistic regression analyses were used, with lift/stair use as the dichotomous dependent variable. Predictor variables such as gender and whether or not the individual was affiliated to the academic sports medicine unit (ESSM or non-ESSM) were entered into the model as independent variables. Logistic regression of odds for using the stairs was determined with Bonferroni correction for 3 comparisons (significance accepted at $p<0.015$). The focus group discussions were not statistically analysed, as the nature of the work was descriptive and was used to develop the signed intervention used in the study.

Results

Formative work

Themes that emerged from the discussions in the focus groups were categorised as facilitating factors and barriers to the use of stairs in the accumulation of intended and/or incidental physical activity. The long waiting period for an available lift was the primary facilitating factor to stair use. The congestion at the lift lobby during peak times was also a facilitating factor to stair use in some participants. These participants became accustomed to stair use and therefore continued this practice throughout the day. A further facilitating factor to stair use was the location of the staircase. Participants interviewed reported that the positioning of the staircase provides a good view of the activities (usually training sessions) taking place on the quadrangular area on the first floor of the building.

The main barrier to the use of the stairs indicated by students/staff was laziness and/or being too busy. In addition, some participants felt that using the stairs would make little/no difference towards improved health and fitness, while others felt that they accumulated enough intended physical activity and did not see the need for additional benefits that may be gained through stair usage.

Intervention programme and observation procedure

A total of 4 256 counts were recorded and entered onto a Microsoft XL spreadsheet. The summarised counts are indicated in Table I and represented graphically in Fig. 2.

The recorded data were entered into the logistic regression model and logistic regression of odds for using the stairs before intervention to intervention (with Bonferroni correction) was calculated. The results indicated that there was a 45% increased odds of using the stairs from before intervention to intervention; a 41% increased odds if you were an ESSM; and a 55% greater odds if you were a woman. Similarly, for comparison of intervention with post-intervention effects, those previously described for ESSM and gender remained – the behaviour did not regress significantly after intervention.

In addition, comparison of pre-intervention with post-intervention data again showed the same effects for gender and ESSM, and the pre-intervention to post-intervention effects were statistically significant ($p<0.015$).

Discussion

From previous studies it is apparent that there is a decline in physical activity levels as energy expenditure-associated work and daily living activities decrease.[26,27] Interventions aimed at increasing incidental physical activity such as using the stairs over the lift have been shown to improve health and fitness levels.[9] Consistent with previous studies,[16,27] the main barrier to the use of the stairs indicated by students/staff was laziness and/or being too busy. In addition, some felt that stair usage would not make a difference towards improved health and fitness. Such information provides useful cues in developing appropriate health promotion initiatives that encourage and support behavioural change in this regard.

Andersen *et al*.[11] suggested that an increase in stair use may not prompt people to significantly alter their overall level of physical activity and that further investment in stair campaigns needs to be looked at with caution. This has been further supported by a study by Marshall *et al*.,[24] with a sample size more extensive than most other studies (approximately 158 000 counts compared with an average of a few thousand observational counts) and a longer intervention period (12 weeks compared with an average of 4 - 6 weeks). The study showed an initial increase in stair walking that declined to baseline levels at follow-up. Similarly, Auweele *et al*.[23] reported a significant increase in stair use for female employees and when a health sign was used. However, as with Marshall *et al*.,[24] this increased stair usage declined to baseline over the study period (7 weeks).

Two studies reported significant increases in stair use which were sustained between baseline and follow-up: follow-up at 2 - 3 weeks after a 4-month intervention period,[28] and follow-up at 2 weeks after a 6-week intervention period.[29] In the latter study, a significant effect on stair climbing (ascent) was seen (OR 1.12, $p<0.005$). Kerr *et al*.[30] reported no significant intervention effect for stair climbing, but there was a significant increase in stair descent (OR 1.21, 95% CI 1.07 - 1.37).

Results of the present study add to the pool of supporting evidence that stair-promoting interventions are a viable public health strategy for increasing incidental physical activity. Moreover, the key outcome intended to be achieved goes beyond simply choosing the stairs over the lift, but rather of bringing about behavioural change towards improved health and fitness. While public health promoters support the notion that accumulating incidental physical activity is a stepping stone towards behavioural change, further research is needed to determine the extent to which modest improvements in incidental activity produce more significant improvements in overall physical activity. A more objective and comprehensive view of overall stair use (e.g. a 24-hour, 7-days-a-week motion-sensing device[24]) is also recommended so that the data are not subject to observer bias or periodic observation periods. In addition, more extensive long-term studies are needed to examine the loss of effect after an intervention.

References

1. Mathers C, Vos T, Stevenson C. The Burden of Disease and Injury in Australia. AIHW cat. no. PHE17. Canberra: Australian Institute of Health and Welfare, 1999.
2. Prentice AM, Jebb SA. Obesity on Britain: gluttony or sloth? BMJ 1995;311:437-439.
3. World Health Organization. Active Living. Geneva: WHO, 1997. www.who.int/hpr/active/objectives.html (last accessed 8 October 2007).
4. British Heart Foundation. Coronary Heart Disease Statistic: British Heart Foundation Database, 1998.
5. Department of Health. At Least Five Times a Week: Evidence on the Impact of Physical Activity and Its Relationship to Health. London: Department of Health, 2004.
6. US Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. Atlanta: Centers for Disease Control, 1996.
7. Jakicic JM, Wing RR, Butler BA, Roberston RJ. Prescribing exercise in multiple short bouts verses one continuous bout: effects on adherence, cardio-respiratory fitness and weight loss in overweight women. Int J Obes 1995;19:893-901.
8. Dunn AL, Andersen RE, Jakicic JM. Lifestyle physical activity interventions: History, short- and longterm effects and recommendations. Am J Prev Med 1998;15:398-412.

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9. Basset DR, Vachon JA, Kirkland AO, Howley ET, Duncan GE, Johnston KR. Energy cost of stair climbing and descending on the college alumnus questionnaire. Med Sci Sports Exerc 1997; 29:1250-1254.

10. Boreham CGA, Wallace WFM, Nevill A. Training effects of accumulated daily stair-climbing exercise in previously sedentary young women. Prev Med 2000;30:277-281.

11. Andersen RE, Franckowiak SC, Snyder J, Bartlett SJ, Fontaine KR. Can inexpensive signs encourage the use of the stairs? Results from a community intervention. Ann Intern Med 1998;129:363-369.

12. Andersen RE, Franckowiak SC, Zuzak KB, Cummings ES, Crespo CJ. Community intervention to encourage stair use among African-American commuters. Med Sci Sports Exerc 2000;32:s38.

13. Blamey A, Mutrie N, Atichison T. Health promotion by encouraged use of stairs. BMJ 1995;311:289-290.

14. Brownell KD, Stunkard AJ, Albaum JM. Evaluation and modification of exercise patterns in the natural environment. Am J Psychiatry 1980;137:1540-1545.

15. Coleman KJ, Gonzalez EC. Promoting stair use in a US-Mexico border community. Am J Public Health 2001;91:2007-2009.

16. Kerr J, Eves F, Carroll D. Posters can prompt less active individuals to use the stairs. J Epidemiol Community Health 2000;54:942-943.

17. Kerr J, Eves F, Carroll D. The influence of poster prompts on stair use: the effects of setting, poster size and content. Br J Health Psychol 2001a;6:397-405.

18. Kerr J, Eves F, Carroll D. Encouraging stair use: banners are better than posters. Am J Public Health 2001b;91:1192-1193.

19. Kerr J, Eves F, Carroll D. Getting more people on the stairs: the impact of a new message format. J Health Psychol 2001c;6:495-500.

20. Kerr J, Eves F, Carroll D. Six-month observational study of prompted stair climbing. Prev Med 2001d;33:422-427.

21. Russell WD, Hutchinson J. Comparison of health promotion and deterrent prompts in increasing use of stairs over escalators. Percept Mot Skills 2000;91:55-61.

22. Webb OJ, Eves FF. Promoting stair climbing: single vs. multiple messages. Am J Public Health 2005;95:1543-1544.

23. Auweele YV, Boen F, Schapendonk W, Dornez K. Promoting stair use among female employees: The effects of a health sign followed by an e-mail. J Sport Exerc Psychol 2005;27:188-196.

24. Marshall AL, Bauman AE, Patch C, Wilson J, Chen J. Can motivational signs prompt increases in incidental physical activity in an Australian health-care facility? Health Educ Res 2002;17: 743-749.

25. StairWELL to Better Health, 2004. http://www.cdc.gov/nccdphp/dnpa/stairwell/index.htm (accessed 13 November 2007).

26. Armstrong T, Bauman A, Davies J. Physical Activity Patterns of Australian Adults. Results of the 1999 National Physical Activity Survey. AIHW cat. no. CVD 10. Canberra: Australian Institute of Health and Welfare, 2000.

27. Pratt M, Macera CA, Blanton C. Levels of physical activity and inactivity in children and adults in the United States: current evidence and research issues. Med Sci Sports Exerc 1999;31:526-533.

28. Titze S, Martin BW, Seiler R, Marti B. A worksite intervention module encouraging the use of stairs: results and evaluation issues. Soc Prev Med 2001;46:13-19.

29. Eves FF, Webb OJ, Mutrie N. A workplace intervention to promote stair climbing: greater effects in the overweight. Obesity 2006;14:2210-2216.

30. Kerr J, Eves F, Carroll D. Can posters prompt stair use in a worksite environment? J Occupational Health 2001;43:205-207.