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Can Health-Promoting Posters Increase Stair Climbing Instead of Using Escalators?

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Abstract: Taking the stairs instead of escalators or elevators is a free and beneficial physical activity that can be done by most people in most places including malls, worksites, libraries and other such facilities. The aim of this study was to investigate the impact of using health-promoting posters to encourage people to use stair instead of escalators in the five underground metro stations in Tehran, Iran. The posters were placed in the point-of-choice between the stairs and ascending escalators at the eye level. The number of people who selected stairs or ascending escalators recorded. Accounts were done at the same time, on the same weekday and 5 consecutive weeks. Observations took place in five stages including baseline, first intervention, first post-intervention, second intervention and second post-intervention. During the study in all five stations, the total number of 48635 choices between the stairs and the ascending escalator were counted. There were significant increase in stair use between baseline and the first intervention phase (from 4.5-19.3%) and between the first post-intervention and the second intervention phases (from 6.6-22.8%) when the posters were introduced for the first and the Second times. In addition, there were significant decrease between the first intervention and the first post-intervention phases (19.3-6.6%) and between the second intervention and the second post-intervention phases (from 22.8-8.7%) when the posters were removed for the first and the second times. However, the level of stair use after the second post-intervention phase significantly exceeded the baseline level (8.7 vs. 4.5%). The results of this study showed that using posters significantly increased the percentage of stair users. Based on these results, it suggests that public health promoters use simple and low-cost tools such as posters to promote lifestyle based health-enhancing physical activity by encouraging individuals to opt stairs.

Key words: Physical activity, stair use, intervention, poster, metro stations, Iran

INTRODUCTION

The human body is designed for movement. Regular physical activity is an integral component of healthy living and can lead to major health benefits. Physical activity is recognized as an important component of a healthy lifestyle (PAG, 2008). Regular physical activity not only contributes to well being but it is also essential for good health, appropriate weight and body composition.

It lowers the risk of developing major chronic diseases such as stroke, hypertension, coronary heart disease, gallbladder disease, osteoarthritis, type 2 diabetes and some cancers (WHO, 2002). It is also associated with lower all cause mortality and morbidity (Booth *et al*., 2000).

The US guidelines recommend that to promote and maintain health, all healthy adults need to engage in moderate-intensity aerobic physical activity for a minimum of 30 min day^{-1} on 5th day week^{-1} or vigorous-intensity aerobic exercise for a minimum of 20 min day^{-1} on 3rd day week^{-1} (Haskell *et al*., 2007).

Research suggests that the increased access to public transportation and built environment influences physical activity participation including recreational walking; placing parking lots a suitable distance from buildings and walking to and from transit (Owen *et al*., 2000; Bauman *et al*., 2002; Humpel *et al*., 2004). There is a growing need for low cost and accessible facilities that can effectively promote physical activity across the community. Although, stair use is not the only method among many required changes to promote a healthy active lifestyle but it is a free and readily available intervention and requires no additional time or skills.

Stair climbing is considered to be a healthy activity. There are many well-documented evidences about the effect of regular stair use in increased fitness and strength, weight loss, improved lipid profiles and reduced

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risk of osteoporosis (Basset *et al*., 1997; Boreham *et al*., 2000). It is estimated that just 7 min of stair climbing a day reduced the chances of dying from coronary heart disease by 62% (Yu *et al*., 2003). Some researchers suggested that the stair use by the slight increase in caloric expenditure (energy expenditure) leads to improvement in the energy balance and it can related to longer-term health outcomes (Benn *et al*., 1996; Boreham *et al*., 2000; Lanningham-Foster *et al*., 2003). It is difficult to determine the exact number of calories burned by stair climbing because body weight and the rate at which the stairs are climbed affect the expenditure of calories (Teh and Aziz, 2002). It is estimated that with each stair ascended burning approximately 0.11 kcal and each stair descended burning approximately 0.05 kcal (Teh and aziz, 2002). Stair climbing requires 9.6 times more energy than the resting state (Teh and Aziz, 2002). This high energy expenditure of stair climbing can prevent of obesity and improve the balance between energy intake and expenditure.

Taking the stairs instead of escalators or elevators may be an easy way for people to become more moderately active. Using stairs is a physical activity that can be done by most people in most places including malls, worksites, libraries and other such facilities. It may have a positive effect on the physical fitness level and the health (Paffenbarger and Olsen, 1996; Andersen *et al*., 1999; Soler *et al*., 2010). Although, stair use is a lifestyle change that can increase physical activity and thereby improve health but it has showed that in public access settings pedestrians predominantly use escalators (Auweele *et al*., 2005; Eves and Webb, 2006; Coleman and Gonzalez, 2001). Communitywide interventions have most often used signs, posters and banners placed at or near stairwells or at the base of elevators and escalators to promote stair use. The majority of previous studies have showed that signs placed at a decision point between stairs and an escalators can increase stair usage in a variety of settings including worksites, train stations, bus terminals, universities, airports, health care settings and shopping centres (Brownell *et al*., 1980; Blamey *et al*., 1995; Andersen *et al*., 1998; Russell *et al*., 1999; Boutelle *et al*., 2001; Kerr *et al*., 2001a; Webb and Eves, 2005; Eves and Webb, 2006; Bungum *et al*., 2007; Coleman and Gonzalez, 2001; Pillay *et al*., 2009). Dolan *et al*. (2006) in their review concluded that placing motivational signs to encourage taking the stairs instead of escalators at the point of decision may help increase stair usage and correct energy imbalances. Each stair intervention uses a before and after study design to examine the effect of signage on the choice of using stairs or escalators. In the other hand, few studies (Marshall *et al*., 2002; Auweele *et al*., 2005) report lack of improvement during and/or after an intervention. Marshall *et al*. (2002) observed an initial increase in stair walking that declined to baseline levels at followup. Similarly, Auweele *et al*. (2005) reported a significant increase in stair use for female employees and when a health sign was used. However, this increased stair usage declined to baseline >7 weeks of the study period. Some studies have shown that other factors such as the attractiveness of the amenities, loads to be carried, aesthetic qualities of a stairwell, the music and the number of stairs influence pedestrian choices (Russell *et al*., 1999; Boutelle *et al*., 2001; Kerr *et al*., 2001b; Webb and Eves, 2005). The present study aimed to investigate the impact of using posters to encourage people to use stair instead of escalators in the five underground metro stations in Tehran, Iran.

MATERIALS AND METHODS

This Quasi-experimental, interrupted time series design study investigate using stairs instead of ascending escalators during baseline, 2 interventions and 2 post-interventions. Five underground metro stations in the city of Tehran where stairs and escalators were directly adjacent were chosen. All stations had a 40-step staircase and an adjacent escalator within sight of each other. The intervention involved the placing of health-promoting posters in the point-of-choice between the stairs and ascending escalators at the eye level.

At this point, people could decide to walk up the stairs or to ride the escalators. The location of each poster was so appropriate that everybody can see it easily. The size of the posters used for this investigation was A1 (594×841 mm). Each poster's message appeared in Persian. It contained the message, use the stairs improve your fitness, stay healthy. This written message aimed to encourage visitors to use the stairs as an alternative to the ascending escalators to improve their health and fitness. The poster approved by a team of researchers of Physical Education Faculty of Tehran University.

Stair use was observed on 5 consecutive weeks in stations, starting on April 1, 2011. Two students in each station directly observed ascending escalators and stairs for 3 days a week. Observations were made at the top of the stairwell near the exit of each station. These observers recorded the number of people who selected stairs or ascending escalators. One of them observed the ascending escalator while the other observed the stairwell. Those carrying items larger than a briefcase, heavy loads, children or with pushchairs were not counted. Accounts were done at the same time (between 09:00 and 12:00) on the same weekday (Monday,

Wednesday and Friday). Each phase of the study lasted 1 week. Maximum temperature and humidity ranges during the study period were almost identical. The initial observation considered as baseline and was done 1 week before the posters were set up. The second observation considered as first intervention phase and was done after the posters set up. The third observation considered as first post-intervention phase and used as a washout period. It was done after the posters had been removed. The fourth observation considered as second intervention phase after setting up the posters again to control the effects of site and to compare proportion of stair use with baseline level and also with first intervention phase. This phase allowed us to test whether the reintroduction of posters would have a similar or stronger effect than the first intervention and also the baseline level or not. The fifth observation was done after the posters were removed again and considered as second post-intervention phase. It was done to investigate the effect of delayed retention.

RESULTS

Based on hypothesis A, we assumed that introduction the posters would significantly increases the percentage of people who take the stairs instead of ascending escalators. Based on hypothesis B1, we assumed that when the posters are reintroduced in the second intervention phase, the proportion of stair use would be significantly higher than baseline level. Based on hypothesis B2, we assumed that when the posters are reintroduced in the second intervention phase, the proportion of stair use would significantly exceed the first intervention phase.

Based on hypothesis C, we assumed that in the second post-intervention phase and after removing the posters again, the percentage of people who take the stairs would be significantly higher than baseline level. During the study in all five stations, the total number of 48635 choices between the stairs and the ascending escalator were observed. Regarding to hypothesis A, there was a significant difference between baseline (4.5% stair climbing) and the first intervention phase (19.3% stair climbing); $\chi^2 = 41.65$, $p<0.001$. Between the first intervention and the first post-intervention phases, stair use decreased significantly from 19.3-6.6%, $\chi^2 = 27.91$, $p<0.001$. Stair use after the first post-intervention phase did not differ significantly from baseline level, 6.6 vs. 4.5%, $\chi^2 = 1.89$, $p<0.20$. Between the first post intervention and the second intervention phases when the posters were reintroduced, stair use increased significantly from 6.6-22.8%, $\chi^2 = 52.23$, $p<0.001$. As predicted in hypothesis B1, stair use after the second intervention phase was significantly higher than baseline level, 22.4 vs. 4.5%, $\chi^2 = 73.42$, $p<0.001$. Moreover, regarding to hypothesis B2, the stair use after the second intervention phase significantly exceeded stair use in the first intervention phase, 22.8 vs. 19.3%, $\chi^2 = 4.13$, $p<0.05$.

When the posters were removed again between the second intervention and the second post intervention phases, stair use decreased significantly from 22.8-8.7%, $\chi^2 = 39.25$, $p<0.001$. However, regarding to hypothesis C, the level of stair use after the second post-intervention phase significantly exceeded the baseline level, 8.7 vs. 4.5%, $\chi^2 = 6.20$, $p<0.05$. Table 1 shows the number of observations and percentages of people using stairs during each phase of the study.

Table 1: No.of observations and percentages of people using stairs during each phase of the study

Phases	Poster (yes or no)	No. of observation	Stair (%)
Baseline	No	2188	4/5
First intervention	Yes	9386	19/3
First post-intervention	No	3209	6/6
Second intervention	Yes	11088	22/8
Second post-intervention	No	4231	8/7

DISCUSSION

The results of this study showed that using health-promoting posters significantly increased the percentage of stair users in the metro of Tehran. The findings indicate introducing the posters could potentially have a significant impact on the number of people deciding to take the stairwell instead of the ascending escalator. Introduction of posters resulted in an increase in the stair use that not only exceeded the baseline level but also other phases.

In addition, the percentage of stair use during the second post intervention phase was significantly higher than baseline level because of a delayed retention effect. These findings suggest that repeated introduction of the posters might reinforce its immediate impact and lead to a longer term retention effect after removal. The findings are similar to the changes in stair use reported in some studies. In that studies it was shown that <10% of individuals used the stairs prior to signs or posters being put in place (Brownell *et al*., 1980; Kerr *et al*., 2001 a, b; Eves *et al*., 2008).

An approximately the same percent (4.5%) of those observed in this study used the stairs before the posters were positioned (baseline). This rate is substantially weak. It is as low as stair climbing in the public housing estates in Hong Kong that only a small number of pedestrians climbed stairs prior to the intervention (Eves *et al*., 2008). Compare to other countries, the rate of stair use in the

metro of Tehran was lower than average rates of 11.6% for underground rail system staircases in the UK and US (Eves and Webb, 2006). In other hand, the majority of studies show that using signs significantly increases the proportion of stair users in variety of settings (i.e., universities, shopping malls and train stations) and some of them indicate that reintroduction of a sign after removal leads to a renewed increase in stair use that exceeds the baseline level (Eves *et al*., 2006; Pillay *et al*., 2009; Coleman and Gonzalez, 2001).

Preliminary evidence was provided that the reintroduction of a poster might result in an amplified effect, lasting to some extent after removal. The impact of introducing health-promoting posters in the present study was remarkable. Yet, although, the rates of stair climbing modestly increased by using posters but they were still low (an increase in stair use of 8.7% after second post-intervention). The increases in stair use in our study were similar to those reported in public transport stations, 7-9% in Glasgow (Brownell *et al*., 1980) and 4% in Copenhagen (Iversen *et al*., 2007).

When interpreting the findings of present study, several limitations should be noted. First, the observations in the stations sometimes were carried out during rush hours that people realized that they may reach their destination quicker by taking the stairs. In contrast, during calmer hours of the day, people might be more likely to use the escalator. Second, regarding this assumption that pedestrian traffic volume affected stair climbing as reported previously (Kerr *et al*., 2001a, b; Webb and Eves, 2005). It seems possible that the initial wave of pedestrians reaching the posters obscured its view from those following. In some studies, particularly those done in the libraries and office buildings, the percent of people who opt the stairs is very high.

It can be justify as most people read the posters and signs at those settings while waiting but in transportation settings people often pass quickly without much thought about the full content of message of the posters. Third, it is not possible to determine the long-term effects of posters in our setting because the same people do not return to the metro station.

Fourth because of the Data collection method used it was not possible to differentiate between age, gender or body weight of people to see whether the posters had similar effects on each type of participants. It should be noted that in order to study the impact of health-promoting posters, interventions should be integrated in a broader and multilevel approach that considers environment, gender, race, culture, etc. Stokols (1996) in the social ecological model demonstrated that all these factors influence health-related behaviours. A major message of present study is that there are so many simple and low-cost methods to promote lifestyle based health-enhancing physical activity by encouraging individuals to opt stairs. As Andersen *et al*. (1999) suggested, we need to invest in stair campaigns to alter the overall level of physical activity in the community.

Faskunger *et al*. (2003) noted that based on available evidence, it is highly surprising to see the lack of health-related messages in society to encourage people to be physically active and to encompass physical activity in their lifestyle.

CONCLUSION

Regarding the results of present study and the strong evidence for the impact of interventions enhancing stair use, it suggests that public health promoters use more encouraging tools (e.g., health-promoting posters and banners) in escalator-rich environments to make some behavioural changes towards improved health and fitness.

RECOMMENDATIONS

Future studies should aim to investigate similar settings with different methodologies, the longer time effects of posters with different message content and size, the consequences of multiple exposures and to carry out more comprehensive and long-term studies (e.g., a 24 h, 7 days a week and monthly observations using motion-sensing devices and pedometers).

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