Using Signage to Promote Stair Use on a University Campus in Hidden and Visible Stairwells

Megan E. Grimstvedt, Jacqueline Kerr, Sara B. Oswalt, Donovan L. Fogt, Tiffanye M. Vargas-Tonsing, and Zenong Yin

Background: This study tested the effectiveness of a stair use promotion strategy in visible and hidden stairwells during intervention and post intervention follow up. Methods: A quasi-experimental study design was used with a 1 week baseline, a 3 week intervention, and post intervention at 2 and 4 weeks in 4 university buildings in San Antonio, Texas with stairwells varying in visibility. Participants were students, faculty, staff, and visitors to the 4 buildings. A total of 8431 observations were made. The intervention incorporated motivational signs with direction to nearby stairwells placed by elevators to promote stair use. Stair and elevator use was directly observed and recorded. Logistic regression analyses were used to test whether stair versus elevator use varied by intervention phase and stairwell visibility. Results: Stair use increased significantly (12% units) during the intervention period and remained above baseline levels during post intervention follow-up. At baseline, visible stairs were 4 times more likely to be used than hidden stairs; however, the increase in stair use during intervention was similar in both types of stairwells. Conclusions: Motivational and directional signage can significantly increase stair use on a university campus. Furthermore, stairwell visibility is an important aspect of stair use promotion.

Keywords: health promotion, physical activity, community-based research, interventions

Physical inactivity is one of the leading health concerns in the United States. Sedentary lifestyle contributes to the increase in overweight and obesity. Both obesity and sedentary lifestyle are modifiable risk factors for several chronic diseases including hypertension, insulin resistance, coronary heart disease and noninsulin dependent diabetes. The American College of Sports Medicine and the American Heart Association recommend that adults engage in moderate intensity aerobic activity for a minimum of 30 minutes on 5 days each week or vigorous intensity physical activity for a minimum of 20 minutes on 5 days each week to promote and maintain health. In 2003, nearly one-third of U.S. adults did not engage in physical activity (PA) at all and in 2005, less than half of U.S. adults met minimum recommended levels of physical activity.

Stair use is one method of incrementally increasing daily moderate to vigorous PA (MVPA). Studies have found several health benefits associated with stair use, such as improved cardiorespiratory fitness and blood lipid profile, lower body fat, weight loss, and increased bone density in response to varying amounts/intensities of stair climbing. Furthermore, stair climbing is an inexpensive PA that is possible in most, if not all multistory buildings and one that requires no special equipment to participate. However, even when stairs are present, individuals often opt for less active means of transport (e.g., elevators/escalators).

The Guide to Community Preventive Services suggest that point-of-decision prompts are useful in encouraging stair use as a form of PA. This method of intervention involves placing a motivational sign near escalators or elevators to discourage its use and/or to promote stair use. Previous studies have used motivational messages placed at the point of choice between elevators and stairs to elicit stair use in public and worksite settings. The majority of these studies have reported a significant increase of stair use ranging from 2 to 16% when compared with baseline observations. Variations in these studies included using different motivational messages, sizes and types of signs, and the use of environmental or aesthetic changes to stairwells. Additionally, these studies have differed in intervention length, ranging from 2 weeks to 3 months. Post intervention observations have taken place from 2 to 12 weeks after the removal of signs.

Previous studies have not examined stairwell visibility—when they are located behind closed doors or hidden from view—as a barrier to stair use. Often public and worksite buildings are designed with hidden stairwells and this is a potential hindrance toward increasing PA.
Normally signage indicating access to hidden stairwells is not provided in a visible manner. Furthermore, no study has tested the effect of combining motivational and directional signage on stair use. Therefore, the current study examined the effects of alleviating this barrier by providing both a motivational cue for stair use as well as directional information for stairwell location. This study tested whether stair use would increase after motivational and directional signs were posted near elevators, whether stair use would remain elevated after the intervention signs were removed, and whether there was any difference in stair use on visible and hidden stairwells at each observation phase. In addition, exploratory analyses assessed potential differences in stair use direction (ascent vs. descent).

Methods

Setting and Design

This was a quasi-experimental study with data collected using cross-sectional method during 4 observation phases: baseline, intervention, and postintervention at 2 and 4 weeks. Most previous studies have used this cross-sectional method due to the difficulties in tracking large numbers of participants in a very short time period. Baseline observations took place for 1 week before the placement of signage at 4 intervention locations. The intervention portion of this study lasted 3 weeks and the post intervention observations took place for 1 week each at 2 and 4 weeks after the removal of the signs.

The intervention was conducted in 4 university buildings in San Antonio. Two buildings had hidden stairwells and 2 had visible stairwells. All the buildings had 5 stories, except for 1, which had 4 and all observations took place on the first floor, the main access point to the buildings. All 4 buildings were relatively new. Visible stairwells were painted, clean, well lit, and well ventilated—factors that have been shown to influence stair use. Hidden stairwells were behind closed doors and appeared unfinished. All research was conducted in accordance with the ethical standards of human participants set forth by the American Psychological Association and with the approval of the University’s Institutional Review Board.

Intervention

The intervention design was guided by a social marketing approach. Social marketing calls for the discovery of potential benefits, barriers, and the appropriate persuasion for the target participant population. Therefore, 3 focus groups (n = 18; male = 44%) were conducted with the target market. Two of the focus groups consisted of university students and the third focus group consisted of faculty and staff members. All focus group participants were recruited in and around buildings that were included in this study. The focus group discussions resulted in several important findings regarding stair use in university buildings. First, among both students and employees, the stairs are more often used when easily accessible and visible upon entrance into buildings. Due to unfamiliarity with building layouts, focus group participants reported a lack of awareness of hidden stairwell locations in the university’s buildings. Therefore, the groups suggested that directional signs should be clearly posted to indicate the location of hidden stairs. Second, with regard to the type of message, statements that provided direct and specific health messages received the highest approval ratings as opposed to general health statements (e.g., step up to a healthier lifestyle). Based on the feedback of the participants, 1 message was chosen from 12 existing stair promotion messages. Finally, focus group participants believed that the motivational signs might make elevator users feel the stigma of “being lazy” but that perhaps this was necessary as it may promote healthy behavior in the future.

The intervention signs measured approximately 24 × 16 inches and were fastened to 5 foot easels and placed on the first 3 floors of each of the observed buildings near the elevators. All buildings had 5 floors, with the exception of 1 building which had 4, however the top floors of the observed buildings were primarily offices (as opposed to classrooms) and experienced much less foot traffic. The motivational message used referred to weight loss and emphasized stair climbing: “Walking up stairs burns almost 5 times as many calories as riding an elevator.” This choice was determined solely from the opinions of the focus group members and may not have been the most inclusive message due to its focus on weight loss. The motivational message was followed by directional information indicating the location of the nearby hidden or visible stairwell, along with an arrow. In addition, the signs contained a caricature of the university mascot walking up the stairs. The 2 hidden stairwells, behind closed doors, had an additional sign (measuring 8 × 6 inches) attached to the door indicating stair access.

Sample

The study took place on a large university campus with an enrollment over 28,000. Potential participants were students, faculty, staff and visitors on campus. A total of 8431 observations were made over 4 study phases. Table 1 describes the characteristics of study participants by gender and age group across study phases. Slightly over half of these were males (50.2%) and most were individuals classified as younger than 40 years old (79.8%). Previous studies have chosen age delineations of 30, 40, and 60 years old. The authors chose 40 years of age as it appeared to be an appropriate median of the university’s student and employee population. This study included (1) those carrying excessively large bags, (2) children and the adults accompanying them, and (3) those that appeared physically unable to use the stairs (e.g., using a cane or crutches to aid in walking, those in wheelchairs).
Measures

Stair use was assessed by visually observing whether a participant chose to use the elevator or stairs. Two trained observers were positioned in inconspicuous, preselected locations at each site with direct view of the entrances to the elevator and stairwell. One observer watched the elevator exclusively while the other observed stair use. Each site location was observed on the same day of the week and at the same time of day for each observation phase. Observations were made Monday through Thursday for 2 hours each day, beginning at approximately 10 AM and ending at noon, which had the heaviest pedestrian traffic of the day. Fridays were excluded from observation due to less pedestrian traffic on campus. In addition, participant’s gender, age (<40 years old and 40+), and stair use direction were also recorded. Four research assistants were trained on observation techniques and coding of participant’s age group. Practice observations were made to calibrate the consistency and accuracy among 4 research assistants.

Analyses

Stepwise logistic regression analyses were performed to examine the impacts of the intervention on participants’ choice of stair use (elevators vs. stairs), using indicator coding. The first block of the analyses tested the likelihood of stair use during the intervention and 2 follow-up phases, compared with baseline, controlling for gender and age. A second block included visibility (hidden vs. visible) as an independent variable to see if stair visibility affected stair use. A third block tested whether there was an interaction between visibility of the stairwells and intervention phase (ie, differential increase in stair use between hidden and visible stairs). An interaction between gender and intervention phase and age and intervention phase was also tested, but was not significant. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. Improvement in model fit at each step was assessed by Omni test based on changes in chi-squares over the previous step. Impacts of the intervention on the direction of stair use (ascent vs. descent) were tested using the same logistic regression model in participants who had used the stairs. Rates of stair use were estimated for baseline, intervention phase, week 2, and week 4 at post intervention and plotted to show the trends of stair use across. All analyses were performed by SPSS 15.0 for Windows (SPSS for Windows, 2006). A p-value ≤ 0.05 is considered significant.

Results

Table 2 presents the test statistics of the logistic regression models. Figure 1 displays the percentage of participants who used the stairs at each phase of the study and the percentage of stair use at each observation phase for visible and hidden stairwells. The first block of the logistic regression model showed that stair use increased significantly (12% units; OR 1.65, 95% CI 1.47 to 1.85; P < .001) from the baseline period to the intervention period. Stair use remained elevated at week 2 (OR 1.37, 95% CI 1.19 to 1.59) and week 4 by 13.4% units from baseline (OR 1.75, 95% CI 1.51 to 2.03) after the intervention was removed. In addition, younger adults and males were significantly more likely to use the stairs. There was no interaction between intervention phase and gender or age; both age groups and genders increased their stair use similarly. Results from block 2 showed that visibility of stairwells was significantly related to stair use. Participants were more likely to use visible stairs (OR 4.68, 95% CI 4.19 to 5.21). The interaction between visibility and study phases was not significant and did not add to the model ($\chi^2(1) = 1.26, P = .74$) as tested in block 3, suggesting no
difference in use of hidden and visible stairwells at each study phase. Increases in stair use were slightly higher, but not statistically significant in visible stairwells (see Figure 1).

The second analysis examined the impact of intervention on direction of stair use (ascent vs. descent) during the 4 study phases and differences in the hidden and visible stairwells. Results from block 3 showed that after controlling for gender and age, there was no interaction between intervention phase and stair visibility; the percentage descending and ascending the stairs on visible and hidden stairwells were similar. Results of this analysis are not shown.

**Discussion**

Findings from this study indicate that signs combining directional and motivational messages significantly increased stair use on a university campus across the intervention (12%) and post intervention phases (7.6% at week 2 and 13.4% at week 4) compared with baseline observation. The increase in stair use ranged from 2% to 16% in previous studies. The high baseline stair use (35.5%) is similar to other workplace settings. The current study was the first to use multiple buildings to successfully increase stair use on a university campus. This study had a shorter intervention and follow-up period compared with most previous studies due to timing conflicts with university holidays; however, its impact on increase of stair use was comparable to studies that had a longer intervention duration. This finding suggests that a shorter intervention can be as effective when signs combining directional and motivational message are used.

The success of this intervention may largely be attributed to the use of a social marketing approach during the design process. Understanding one’s target environment is a central concept of social marketing and focus groups are one method of accomplishing this. Information obtained in the focus group discussions was crucial in tailoring the intervention to the campus population, such as locations of signage placement and choice of the message. In addition, combining a motivational message with directional information likely enhanced the effectiveness of the intervention. To our knowledge, no previously published studies have included the addition of directional aids. These findings may indicate the importance of a population-specific focus group’s ability to identify the needs, concerns, and preferences of the study population.

**Table 2. Parameter Estimates, Odd Ratios (ORs), 95% Confidence Interval (CI), Model Fit Statistics for Stepwise Logistic Regression on Stair Use**

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<th>β</th>
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<th>P</th>
<th>ORs</th>
<th>95% CI</th>
<th>χ²*</th>
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* Omni test for detecting significance of model improvement over the previous step.
Abbreviations: β, beta; SE, standard error; P, p-value; ORs, odds ratios; 95% CI, 95% confidence interval; χ², chi-square; df, degrees of freedom.
In contrast to previous studies, stair use remained elevated at 4 week post intervention. Since the intervention was implemented during a normal semester, we do not anticipate that stair use was inflated by an unusual event. It is possible that stair use remained high in the campus population because they were regular users of the buildings and had developed a stair use routine that they maintained, even after removal of the prompts. The previous long term studies were conducted in public places with transient populations such as shopping centers and transit centers where stair users may have not been exposed so consistently to the messages.

The current study is unique in that stairwell visibility was examined; an issue that previous studies have not considered. Visibility was identified as a factor in this study as a result of focus group discussion. Visible stairwells are open and have aesthetically pleasing architectural designs. The hidden stairwells, on the other hand, are behind closed doors, are often dimly lit, and appear unfinished. In the current study, the visible stairwells were clean, lightly painted, and well lit with good ventilation. During baseline observation, visible stairs were 4 times more likely to be used than hidden stairs. Stair use increased similarly in both hidden and visible stairwells. Therefore, our findings suggest that awareness of stairwells appear to be important factors in promoting the use of both open and hidden stairs. However, the addition of directional cues to the motivational message did not provide further benefit in terms of increasing stair use in hidden stairwells more than in visible ones as we hypothesized. Clearly, other strategies that go above and beyond the awareness of the location of stairwells are needed to address this problem in future studies.

One previous study identified stair direction as an important aspect in point of choice studies since stair climbing elicits greater health benefits. The authors suggest that future studies take this into consideration with regard to message choice. In the current study, the intervention message was a direct result of focus group discussion and did emphasize stair climbing. However, there was no significant difference between stair ascent and stair descent throughout the study. Using a motivational message specifically identifying a benefit of stair climbing does not appear to have a greater effect on stair ascent compared with stair descent. We only observed stair and elevator use on the first floor and therefore do not take into account differences in stair ascent or descent that may have occurred between the upper level floors.

Certain limitations to this study should be noted. Since this study was based on data collected using
cross-sectional methods, it is difficult to ascertain whether there were individual increases in stair use (i.e., whether increased stair use was a result of many people at the locations using the stairs more or from a few individuals using the stairs a lot more). Since observations were made at the same time and place each week during the semester, increased traffic flow was unexpected and these changes in use were most likely the result of the intervention. However, since we did not use a control building, we were not able to address this question more clearly. It is important to note that it is unknown whether observations made outside the specified 2-hour time block may have resulted in different data trends. Another recognized limitation of this study is a lack of precision with regard to evaluating participant age through observational means alone. Similarly, nonvisible physical constraints might force elevator use thereby creating an erroneous user count. However, these limitations should not discount the value of our overall findings considering the potential impact the increased daily MVPA could have on individual as well as population health and fitness.

Future point of choice research endeavors would likely benefit from further qualitative research including both focus groups before and follow up surveys or interviews after the intervention to discover additional information about the target environment and to determine whether increased healthy behavior has the potential to be generalized to other settings.

In conclusion, the use of directional information in addition to a motivational message successfully increased stair use 12% units during intervention and remained above baseline stair use levels at both 2 and 4 weeks post intervention on a university campus. The direct implication of this study is that directional and motivational signage can increase MVPA on a university campus. Hidden stairwells are underutilized compared with open, visible stairwells. It is clear that stairwell visibility and/or awareness of stairwell location are important aspects of stair use. Organizations that are committed to increasing MVPA in their employees and/or patrons should recognize the importance of stairwell visibility within their building(s). In locations with hidden stairwells, a protocol similar to the one presented here could easily be adopted to increase stair use PA. Future studies should explore additional ways to increase stair use in hidden stairwells. In addition, future architectural undertakings should also take stairwell visibility into consideration for designs of new public and worksite buildings as a means of indirectly promoting stair use.

References


