Boosting Workplace Stair Utilization: A Study of Incremental Reinforcement

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Purpose: This study was designed to determine whether engagement in stair taking can be increased in a worksite setting through the provision of an employer-sponsored, behavior-based incentive system in which employees (members) accumulate points that can be redeemed for merchandise.

Methods/Design: ChipRewards implemented stair utilization in one employer as a part of a larger health incentive engagement program. Using an AB (baseline-intervention) design, members (N=216) were observed for 6 months (6.17.10 to 12.14.10 or 129 weekdays after excluding 52 weekend days) before the intervention (baseline) and after 6 months (1.1.11 to 6.30.11 with the same number of weekdays) of implementation. Results: Members were 84% female, 51% Caucasian, 48% African American, 3% Hispanic, and 45 years average age. The number of total stair transactions for all members for all days monitored increased from 5,070 to 38,900, and the average number of stair transactions per day rose from 39 to 301, representing over a 600% increase. The overall cost of incentives for stair utilization was $3,739.30 or $17.55 per member on average.

Conclusion/Implications: This study supports that stair usage in the workplace is a viable way to increase physical activity. This study adds to existing research that attempted to increase stair utilization through promotion only by adding a behavioral reinforcement strategy. Finally, this study demonstrates that a physical activity among employees at the worksite can be increased with minimal relative cost.

Keywords: engagement, incentives, stairs, physical activity, health behavior

Impact and Implications

• Although the literature is clear that increased physical activity can positively impact physical health, effective behavior change interventions are limited. This study extends the research on promotional approaches to increase routine tasks of daily living to satisfy a person’s physical activity requirements.

• This study confirms that stair-taking behavior can be substantially increased among employees in the workplace by providing contingent monetary incentives.

• Stair usage in the workplace is a viable, cost-effective way to improve public health at a population level.

• Reward and incentive programs are highly valued these days and popular in many areas of commerce and can be adapted to targeted health and wellness behaviors. This strategy can be easily incorporated into many office buildings and companies across the country where people spend most of their day.

Introduction

Health promoters launched a well-meaning physical fitness campaign in the 1990s. Unfortunately, the 60 min of daily vigorous exercise touted as necessary to attain maximum health benefits was discouraging to those who lacked the time and interest for such a strenuous fitness commitment and who were frustrated by the all or nothing message. Persons with physical, developmental, and psychiatric disabilities may experience even greater barriers to participating in adequate physical activity (Badia, Orgaz, Verdugo, & Ullán, 2012; Lassenius, Akerrlind, Wiklund-Gustin, Arman, & Söderlund, 2012; Rimmer & Marques, 2012). Health scientists came up with an alternative approach that would alter how the goal of attaining physical fitness was pursued. Could the accumulated energy expenditure from the routine tasks of daily living satisfy a person’s physical activity requirements?

One daily task is the simple, free, and accessible act of ascending and descending stairs. While scientists in physiology, sports medicine, and epidemiology continue to add to the body
of evidence about the health benefits associated with the usage of stairs, health behaviorists and educators seek to find ways to encourage the public to incorporate stairs into their daily lives so that they can reap these benefits.

The Physical Benefits of Stair Usage

Research results from the few studies that were conducted on stair usage in the late 1970s and early 1980s found that people who actively climbed stairs were more fit and had a higher aerobic capacity (Ilmarinen et al., 1978), that climbing two flights per day could lead to a 2.7 kg weight loss over 1 year (Brownell, Stunkard, & Albaum, 1980), and that the activity required about 8–11 kcal of energy per minute, which is high relative to other physical activities (Edwards, 1983). The resurgence of scientific interest in the topic that began in the 1990s and continues today has contributed a great deal more evidence that stair usage is a viable way to improve the public’s health. A 1993 study found that a significantly lower risk of mortality could be found in individuals that climbed more than 55 flights per week (Paffenbarger et al., 1993), and by the year 2000, the same authors found that climbing as few as 10 flights a week predicted longevity (Lee, Sesso, & Paffenbarger, 2000).

Specific health gains were also discovered. Moderate intensity climbing of 10–20 flights per week reduced the incidence of lung cancer (Lee, Sesso, & Paffenbarger, 1999), as well as stroke risk, with the highest reduction noted between 20 and 35 flights per week (Lee & Paffenbarger, 1998). A study in which participants increased from 1 to 5 flights of stairs for 5 days per week found a 17.1% increase in maximal oxygen consumption (VO2MAX), and a 7.7% reduction in low density lipoprotein (LDL). These results lead researchers to conclude that short bouts of stair climbing totaling 11 min a day can positively impact risk factors for cardiovascular disease (Bassett & Howley, 1997). A 10-year prospective study estimated that vigorous energy expended for a mere 7 min per day could reduce a person’s risk of developing coronary artery disease by two-thirds (Grimstvedt, Woolf, Milliron, & Manore, 2010), while another study reported that stair climbing programs were found to increase the amount of high density lipoprotein (HDL) concentration in blood (Boreham, Wallace, & Nevill, 2000). Another positive finding was that an average of 13 flights per week was associated with increased bone mineral density at the hip and whole body in postmenopausal women (Boreham et al., 2005).

Facilitating Stair Usage

The findings from the studies discussed above make it evident that stair usage can positively impact the public’s health; the next step is to educate and engage people to actively demonstrate the behavior. Jacqueline Kerr, a noted researcher on the subject of stair usage, has shown that moderate intensity activities such as stair climbing may be easier to promote to the public than vigorous activities (Kerr, Eves, & Carroll, 2001b), and that the accumulated time spent using the stairs can make a significant contribution to a 30 min a day activity goal (Kerr et al., 2001b). Participants had a high level of confidence in their ability to perform this activity (Kerr et al., 2001b). She concluded that because current population participation rates are low, increasing stair usage could reap substantial public health dividends (Kerr et al., 2001b).

A current emphasis on health education research is on how to get these messages out in an effective manner that results in behavior changes that are sustainable. It has been estimated that between 6% and 15% of promotional interventions have had success, but all too often the success is transient, as was the case in a 12-week signage intervention that increased stair use, only to see it trend back toward baseline rates after the promotional signs were removed (Webb & Eves, 2007). It has been reported that banners are more effective prompts in promoting stair usage than the posters used in earlier interventions (Kerr, Eves, & Carroll, 2001c), that single repetitive message stair riser banners are as effective as multiple message banners in promoting stair usage (Kerr, Eves, & Carroll, 2001a), and that stair riser banners elicited ongoing usage of stairs when left in place, suggesting that public health benefits can be realized if an intervention, however simple, is sustained (Kerr et al., 2001a).

Purpose

This study seeks to determine whether engagement in stair taking can be increased and sustained in a worksite setting through the promotion of an employer-sponsored, behavior-specific incentive system in which employees accumulate points for taking the stairs that can be redeemed for merchandise.

Method

Study Context

ChipRewards is an incentive-based health and wellness company that rewards individuals for engaging in healthy behavior. The enterprise platform manages customized initiatives designed to create sustainable, long-term health behavior change and cost savings. ChipRewards leverages advanced technology to integrate existing health and wellness initiatives under a single tracking system. The system allows users to capture and reward behaviors from a variety of data sources: health risk assessments, preventive screenings, wellness education programs and events, exercise activities, nutrition and weight management programs, medication adherence, and disease management programs.

This stairs incentive offering was part of a larger health and wellness incentive program where employees from one company (client) could earn up to $150 in points annually if they completed a variety of health and wellness activities. These activities included completing a health risk assessment, biometric testing and feedback, participation in weight loss and healthy lifestyle programs, engaging in health education classes, and utilizing generic medications.

Population

There were 216 members of the ChipRewards program observed in this study. Members were 84% female, 51% Caucasian, 48% African American, 3% Hispanic, and 45 years average age. They were employees from a local business, and all worked in the same building with eight floors and two elevators. This represented 96% of all employees working in this building during the study period. The University of Alabama at Birmingham Institutional Review Board provided human subjects research protection and...
oversight for this research. ChipRewards provided the lead author de-identified data for analysis and write-up of the study. Permission was granted to use the de-identified data from the client.

Design

The design was a naturalistic, quasi-experimental, AB (baseline-intervention) design. Employees were observed for 6 months (6.17.10 to 12.14.10 or 129 weekdays after excluding 52 weekend days) before the intervention (baseline) and after 6 months (1.1.11 to 6.30.11 with the same number of weekdays) of the intervention with a 2-week period for promotion of the new stair-taking target behavior in between baseline and the intervention.

Behavioral Intervention and Stair-Taking Incentives

Employees were eligible to receive incentives for health behaviors by activating their own Web-based ChipRewards account. This personalized account provides information about targeted health behaviors and related incentives, an accounting of earned points within 24 hr, and an Internet link to purchase prizes for points to be mailed to their homes within 3 days. The rationale for the reinforcement was based on a standard incremental schedule with bonuses. For the stair utilization behavior, employees could earn 10 points (one penny per point) per stair transaction, defined as ascending or descending at least one flight of stairs for at least 2 min, with a maximum of 20 points (.20 cents) per day no matter how many times they take the stairs (standard points). Employees could earn bonus points for utilizing the stairs twice a day for an entire week (Monday through Friday consecutively); 50 bonus points could be earned for 1 week of consecutive daily stair use, 150 for 2 weeks, 250 for 3 weeks, and 500 for 4 weeks. This bonus schedule started over and repeated itself every 4 weeks. The maximum number of points (and dollars) that could be accumulated if an employee took the stairs at least twice each and every weekday was 1,390 points ($13.90) each month and 8,340 points ($83.40) over 6 months.

Dependent Variable

The number of stair transactions was the dependent variable. This worksite was already outfitted with a Stanley B.A.S.I.S. ET 691 proxcard reader system for security monitoring that requires employees to swipe a card to gain access to certain parts of the building, including the stairwells. Stair transactions were recorded electronically each time an employee entered and exited (on another floor) the building’s secure stairwell by swiping their identification card. Stair utilization data was downloaded each night electronically each time an employee entered and exited (on another floor) the building’s secure stairwell by swiping their identification card. Stair transaction variables include number of stair takers (those members who had at least one stair transaction during the observation time) and number of stair transactions (electronic record from security card swipe of stairwell entry and exit). Average number of stair transactions per member and number of stair transactions per member per weekday were calculated. These variables were calculated at baseline and intervention periods.

Procedure

For this study, stair use was added as a new target behavior to the employer’s existing health incentive engagement program. Prior to its promotion, stair utilization was regularly electronically monitored among all employees for security purposes. These records were obtained for purposes of this study during the 6-month baseline and intervention periods. Upon completion of the baseline period, the employer promoted the addition of taking the stairs as a new incentivized behavior through communication from human resource, corporate town hall meetings, e-mails, and newsletters and flyers. Reminders of such incentive campaigns were also included in the monthly incentive account statements that members receive from ChipRewards. No formalized training was undertaken because employees were familiar with operating the card readers and their ChipRewards accounts. After a 2-week post-baseline promotion period, stair utilization was activated as an incentivized behavior and monitored among all employees for the 6-month intervention period.

Analyses

In this study, days of observation were 129 opportunity weekdays (after excluding weekend days) before and after intervention. The number of stair takings per week was set to 0 if an employee did not take stairs on any weekday. Common descriptive statistics were used. The McNemar’s test was used to compare the number of employees who took stairs at least one time during the 129 weekdays before and after intervention. The signed rank test was used to compare the average number of stair transactions per member before and after intervention because of non-normality.

Results

Stair Transactions

Figure 1 depicts the increase in total stair transactions among ChipRewards members by months before and after implementation of the incentive intervention. This effect was substantial and immediate the first month after implementation and sustained throughout all subsequent months. Table 1 reveals the number of new stair takers from baseline to the intervention period also significantly increased by 85 members from 128 to 213 or 66.4%. All but three members recorded at least one stair transaction during the intervention period. The number of total stair transactions for all members from baseline to intervention periods increased from 5,070 to 38,900. On average, each member increased their total stair usage from 23 stair transactions during baseline to 180 stair transactions during the intervention period and from almost no daily stair usage (0.2 times per day) to more than one (1.4 stair transactions) per day.

Incentives Earned

Points and dollars (standard, bonus and total) earned by the program overall and by ChipRewards members with any stair transactions (N = 213, subtracting 3 members who had no stair transactions) during the 6-month intervention period (1.1.11 to 6.30.11) are presented in Table 2. Results revealed that the overall cost of incentives for the program was $3,739.30 and $17.55 per member on average. The majority of points and their
costs were attributable to standard points, while 38% were for bonus points.

Discussion

The simple, free, and accessible act of ascending and descending the stairs in this workplace was substantially boosted by over 600% and sustained for 6 months. New stair takers increased by 85 members or 66.4%. This study demonstrated not only increased stair utilization, but also new engagement in a physical activity.

Did this routine task of daily living, however, satisfy a person’s physical activity requirements? On an individual level, the literature in the introduction suggests anywhere from 10 (2/day) to 55 (11/day) flights per week are associated with real health benefits. Our study showed that the average member increased from almost no daily stair usage (0.2 times per day) to more than one (1.4 stair transactions) per day which nearly met the minimum requirement per average employee. Among those in the 75% percentile (top performers), the number of stair transactions during the 6-month intervention period per member per day ranged from 2–22 and 287–859 per member over 6 months meeting or exceeding the standard.

Was the effect sustainable? As with many behavior change programs (especially behavioral interventions) that achieve success, all too often the success is criticized as transient, only to see it trend back toward baseline rates after the intervention was removed. In this study, the substantial overall gains were immediate and sustained over a 6-month period. Further research is needed to demonstrate further sustainability, after removal of monetary incentives, through social reinforcement from walking groups or personal recognition of improved strength and endurance.

Are providing incentives for health behaviors feasible? The cost of this intervention was modest for the substantial resulting impact. The incentive for at least one stair transaction a day was only 20 points (equivalent to 20 cents). The maximum number of points (and dollars) that could be accumulated if an employee took the stairs at least twice each and every weekday was 1,390 points ($13.90) each month and 8,340 points ($83.40) over 6 months. The actual overall cost of incentives for the program was $3,739.30 or $17.55 per member on average. Most large self-insured companies or companies with health and wellness budgets could easily afford this cost for the benefit. Relative to other health care costs, the cost of this intervention per member is equivalent to the cost of one primary care office visit copay.

Strengths of this study include evidence of a large effect, objective measurement of the intervention outcome, rapid provision of feedback to participants, rapid delivery of reinforcement, implementation of the intervention in an ecologically

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Change</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stair takers</td>
<td>128 (59.4%)</td>
<td>213 (98.6%)</td>
<td>85 (66.4% increase)</td>
<td>( p &lt; .0001^a )</td>
</tr>
<tr>
<td>Number of stair transactions</td>
<td>5,070</td>
<td>38,900</td>
<td>33,975 (669.7% increase)</td>
<td>No applicable statistical test</td>
</tr>
<tr>
<td>Average number of stair transactions per member, ( M (SD) )</td>
<td>23.5 (48.2)</td>
<td>180.1 (173.8)</td>
<td>156.6 (159.5) (666.4% increase)</td>
<td>( p &lt; .0001^b )</td>
</tr>
</tbody>
</table>

\( ^a \) McNemar’s Test.  \( ^b \) Signed rank test using data of 216 participants.
valid setting (i.e., a workplace), very high participation by the potential subject pool in the study, low measurement burden on subjects, and a modest cost of implementing the intervention. As an anecdote, the monitoring of stair use using an existing security system was also the impetus for the decision to add stair-taking behavior to the ChipRewards health behavior incentive package. This clever, naturalistic, but objective strategy of monitoring of a health behavior in a work setting demonstrates the successful translation of rigorous behavioral monitoring and reinforcement principles into a real world health promotion context in the workplace.

A limitation of this study includes the fact that the observed effect was found in only one company, one building, and with a unique security monitoring system. The employees were already experienced with health behavior reinforcement and primed for adding stair use as a new behavior to their existing program. Application to other work site contexts is needed to generalize these effects. The design was also a naturalistic, AB design, not a more rigorous randomized clinical trial (RCT) or even return to baseline ABA (baseline, intervention, return to baseline) design. AB designs do not explain or control for confounding or other historical variables that may be responsible for the results. While the results are compelling, more rigorous designs may offer more control and understanding of extraneous variables. Because the security system only registered a stair transaction upon entry and exit of the stairwell over a period of at least 2 min, there was no way to tell how many flights of stairs the employee took. In this study, we counted each entry and exit as one transaction and would conservatively assume that this represented at least one flight. In reality, this was likely to be more. Finally, it is important to note that stair utilization was a part of a larger incentive offering and the findings of this study must be interpreted within this context. Whether or not this single behavior would have changes as compared to the potential subject pool is in the study, low measurement burden on subjects, and a modest cost of implementing the intervention.

In conclusion, this study supports that stair usage is a viable way to increase physical activity based on a simple learning theory-based approach. While stair utilization is not the answer for everyone, especially those people without access or the physical capabilities to climb stairs, this study demonstrates how incentives can be effectively used to increase engagement in a broader variety of routine tasks of daily living. This study adds to existing health promotion research that attempted to increase stair utilization through promotion only by adding a behavioral reinforcement strategy. Finally, this study demonstrates that a physical activity among employees at the worksite can be increased in a very cost-effective way.

References


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