Point-of-Decision Prompts to Increase Stair Use

A Systematic Review Update

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Abstract: In 2000, the *Guide to Community Preventive Services* (*Community Guide*) completed a systematic review of the effectiveness of various approaches to increasing physical activity including informational, behavioral and social, and environmental and policy approaches. Among these approaches was the use of signs placed by elevators and escalators to encourage stair use. This approach was found to be effective based on sufficient evidence. Over the past 5 years the body of evidence of this intervention has increased substantially, warranting an updated review. This update was conducted on 16 peer-reviewed studies (including the six studies in the previous systematic review), which met specified quality criteria and included evaluation outcomes of interest. These studies evaluated two interventions: point-of-decision prompts to increase stair use and enhancements to stairs or stairwells (e.g., painting walls, laying carpet, adding artwork, playing music) when combined with point-of-decision prompts to increase stair use. This latter intervention was not included in the original systematic review.

According to the *Community Guide* rules of evidence, there is strong evidence that point-of-decision prompts are effective in increasing the use of stairs. There is insufficient evidence, due to an inadequate number of studies, to determine whether or not enhancements to stairs or stairwells are an effective addition to point-of-decision prompts. This article describes the rationale for these systematic reviews, along with information about the review process and the resulting conclusions. Additional information about applicability, other effects, and barriers to implementation is also provided.

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Introduction

The prevalence of overweight and obesity in the U.S. has increased over the past several decades. In 2003–2004, 66.3% of adults in the U.S. were overweight or obese, and 32.2% were obese.[1] Obesity increases the risk of many diseases and health conditions, including hypertension, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, and some cancers.[2] The primary cause of overweight and obesity in the U.S. is energy imbalance.[2,3] Energy imbalance occurs when the number of calories used is not equal to the number of calories consumed. Energy expenditure has been on the decline in the U.S. for decades, due in part to increasing automation of previously manual activities. In 1996, the U.S. Preventive Services Task Force (USPSTF) recommended that healthcare providers counsel all patients on the importance of incorporating physical activity into their daily routines.[4] One way to increase energy expenditure, and improve energy balance, is to incorporate small bouts of physical activity into daily routines.[3]

Many intervention approaches are available to increase engagement in physical activity by adults.[5] Each of these approaches has a set of advantages and disadvantages and can be applied, with differing degrees of success, to people with a variety of demographic characteristics and lifestyles in diverse locations. As noted in an earlier review by

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the *Guide to Community Preventive Services* (*Community Guide*), which evaluated interventions designed to increase physical activity, "the role of community-based interventions to promote physical activity has emerged as a critical piece of an overall strategy to increase physical activity behaviors among the people of the United States."[5] This 2002 review focused on community-based intervention approaches, including:

- Informational approaches to change knowledge and attitudes about the benefits of and opportunities for physical activity within a community;
- Behavioral and social approaches to teach people the behavioral management skills necessary both for successful adoption and maintenance of behavior change and for creating social environments that facilitate and enhance behavioral change; and
- Environmental and policy approaches to change the structure of physical and organizational environments to provide safe, attractive, and convenient places for physical activity.

This article reports the findings from an update to the 2002 Point-of-Decision Prompts review, which is a behavior and social approach as described above. The updated systematic review examines literature regarding the effectiveness of prompts on increasing stair use either by increasing the number of actual stair users or increasing the frequency of stair use through prompts that relate to both of these foci, which can be implemented by communities to help increase levels of physical activity. Point-of-decision prompts can be used alone or with stairwell enhancements in an attempt to improve the effectiveness of the prompt (i.e., by making stairwells more attractive to potential users).

Guide to Community Preventive Services

The systematic reviews in this report present the findings of the independent, nonfederal Task Force on Community Preventive Services (Task Force). The Task Force is developing the *Community Guide* with the support of the USDHHS in collaboration with public and private partners. The CDC provides staff support to the Task Force for development of the *Community Guide*. The book, *The Guide to Community Preventive Services. What Works to Promote Health?* (Oxford University Press, 2005; also available at www.thecommunityguide.org) presents the background and the methods used in developing the *Community Guide*. The physical activity review noted above was published in the *American Journal of Preventive Medicine* in 2002[5,6] and describes the broader analytic framework used to evaluate the effectiveness of community-based physical activity interventions.

Methods

This updated review was conducted according to the methods developed for the *Community Guide*, which have been described in detail elsewhere.[5,7] As an update to an existing *Community Guide* review,[5] some information and guidance was drawn from the previous review team and resulting documentation. Inclusion criteria for studies in this review were: (1) primary research published in a peer-reviewed journal; (2) published in English before April 20, 2005; (3) met the minimum research quality for study design and execution[7]; and (4) evaluated the effects of point-of-decision prompts to encourage stair use (with or without enhancements to the stairwell). The outcome measure remained stair use, and the search strategy was widened by inclusion of additional electronic databases. The systematic review team (the team) accepted the broader conceptual approach of the original physical activity review[5] but developed a new conceptual framework for the interventions evaluated in this update. The team recalculated the original effect size measure (relative change) and calculated a new summary effect measure (absolute change); reexamined the evidence regarding applicability of this intervention; and updated the overall conclusions based on the original six studies and an additional ten studies found through the updated literature search.

Conceptual Approach

Point-of-decision prompts are motivational signs, placed at or near stairwells or at the base of elevators and escalators, encouraging people to use the stairs. These prompts are typically designed to change a behavior of interest by providing information about a healthier alternative or establishing a deterrent to the behavioral standard (e.g., announcing that an elevator is off limits to those capable of using stairs), with the intended goal of motivating and enabling people to change their behavior and maintain that change over time. Stairwell enhancements improve the appearance of stairwells by painting walls or laying carpet. A conceptual approach was used to evaluate the effectiveness of point-of-decision prompts and stairwell enhancements to increase stair use. The approach suggests that extended presence of a point-of-decision prompt designed to increase stair use might work by changing individual knowledge or attitudes about using the stairs. Information provided through stair prompts might also contribute to an individual's change in knowledge or attitudes about the value of physical activity in general. As a result, prompts are expected to increase the use of stairs as a mode of transportation and may change attitudes toward or amount of engagement in physical activity. Walking up or down stairs uses more energy than taking an elevator or escalator, and stair use requires bodily movement. The relationships between stair use and caloric expenditure and between stair use and physical activity were not reviewed. This conceptual approach suggests that the slight

increase in caloric expenditure (energy expenditure) resulting from stair use, which serves to improve energy balance can, in combination with other forms of physical activity, contribute to physiologic improvements that are, in turn, related to longer-term health outcomes.

Selection of Outcomes for Review

The primary outcomes examined in this review were objective measurements of changes in the use of stairs during two or more periods of time. Objective measurements were visual counts of people using the stairs or electronic counts (from devices such as motion detectors). Some of the qualifying studies reported other outcomes which were examined but are not presented in this report.

Selection of stair use as an outcome assumes that small amounts of physical activity on a regular basis will help improve the energy imbalance that affects large numbers of people (particularly people who are sedentary and those who are obese). Stair use typically involves ascending or descending one to four flights per day. Using stairs expends twice as much energy as using elevators[8] with each stair ascended burning approximately 0.11 kilocalorie and each stair descended burning approximately 0.05 kilocalorie.[9] Regular, substantial stair use (as many as six assents of 199 steps per assent per day for 12 weeks) has been shown to improve cardiovascular outcomes among previously sedentary young women[10] and Benn et al., in their study of a small group of older men found that

> climbing only three to four flights of stairs at a moderate pace (approximately 50–70 s) elicits peak circulatory demands similar to, but at a much more rapid rate of adjustment than, 10 minutes of horizontal walking at 2.5 mph, intermittently carrying a 30-pound weight, or 4 minutes of walking up a moderately steep slope.[11]

Over the long-term, this added energy expenditure could contribute to improved energy balance and longer-term health outcomes such as weight control.

Search Strategy

The articles considered for this review were obtained from systematic searches of multiple databases, reviews of bibliographic reference lists, and consultations with experts in the field. The team's updated search for evidence encompassed the period from 2000 to April 2005, which overlapped with the search conducted for the original *Community Guide* review of these interventions (search period 1980–2000).[5] The original review used the following seven databases: Enviroline, MEDLINE, PsychInfo, Social SciSearch, Sociological Abstracts, Sportdiscus, and Transportation Research Information Services (TRIS). For the team's updated search, the following 15 databases were examined: ArticleFirst, CINAHL, EMBASE, Enviroline, Health Promotion and Education Database, MEDLINE, Ovid, PsycINFO, PubMed, Social SciSearch, Social Science Citation Index, Sociological Abstracts, SPORTDiscus, Transportation Research Information Services (TRIS), and WorldCat. This list includes some databases not available at the time of the original review.

Evaluating and Summarizing the Studies

Each study that met the inclusion criteria was evaluated for the suitability of the study design and study execution using the standardized *Community Guide* abstraction form.[12] The suitability of each study design was rated as greatest, moderate, or least depending on the degree to which the design protects against threats to validity. The execution of each study was rated as good, fair, or limited on the basis of several predetermined factors that could potentially limit a study's utility for assessing effectiveness. Each study was reviewed by at least two trained researchers. Concerns about study design and execution were discussed with an expert in physical activity interventions and differences in opinion were resolved by consensus among a team of three systematic reviewers (the coordination team). Only studies rated greatest or moderate in design suitability and good or fair in execution were considered qualifying studies and included in the team's final assessment of the evidence in this review. Studies with limited execution are, by *Community Guide* methods, excluded from consideration, and studies of least suitable design were excluded by the coordination team because the body of literature was adequately represented with moderate and greatest suitability study designs.

Calculation of Effect Sizes

The qualifying studies provided measurements of change in the number or proportion of people using the stairs before and after the implementation of point-of-decision prompts (with or without additional enhancements to the stairs or stairwells). To facilitate comparison across studies and an evaluation across the body of evidence, individual study arm results were converted (if necessary) into measurements of both absolute and relative percentage change. In addition, whenever possible, a mean effect size was calculated on the entire sample in each study arm. Studies contained more than one study arm when there were multiple locations or mechanisms of implementation for the intervention. In some cases, effect measures were reported for subgroup means (e.g., one for men and one for women). For these study findings, the mean of the subgroups was incorporated into the overall calculations for median and interquartile interval (IQI), thus providing only one independent effect size per study arm (these are referred to as data points). For time–series studies without a concurrent comparison group, the effect sizes (using pretest measurements and the last postintervention measurement provided) were calculated as follows:

absolute percentage change (difference is described as "percentage point change"),

$$\text{Effect size} = I_{post} - I_{pre};$$

relative percentage change (result is described as "percentage change"),

$$\text{Effect size} = ((I_{post} - I_{pre})/I_{pre}) \times 100.$$

For the study that included a concurrent comparison population (not exposed to the intervention), the effect size was calculated as follows:

absolute percentage change (difference is described as "percentage point change"),

$$\text{Effect size} = (I_{post} - I_{pre}) - (C_{post} - C_{pre});$$

relative percentage change (result is described as "percentage change"),

$$\text{Effect size} = ([(I_{post} - I_{pre}) - (C_{post} - C_{pre})]/I_{pre}) \times 100.$$

For all calculations, I = intervention group; C = comparison group; and "pre" and "post" subscripts indicate measurements taken before and after intervention implementation. For studies in which multiple postintervention measurements were taken, the measurement most distant from the end of the intervention is used. In addition to the calculation of effect sizes for each study, an overall median effect size and interquartile interval were determined for both absolute and relative percentage change.

Throughout the results section effect sizes are presented as both absolute and relative change. The original review of point-of-decision prompts[5] reported relative change only; thus relative change is reported in this paper to allow for comparisons across reviews. Absolute change is also reported because it provides an estimate of change that is not dependent on baseline rates (that may vary according to setting or other population characteristics).

Results

Part I: Interventions to Increase the Use of Stairs (Updated)

The team examined the evidence from qualifying studies for two related interventions: (1) point-of-decision prompts; and (2) stairwell enhancements when combined with point-of-decision prompts.

Review of Evidence: Point-of-Decision Prompts

Point-of-decision prompts are motivational signs placed on or near stairwells or at the base of elevators and escalators encouraging people to use stairs. These signs, such as the one shown in Figure 1, inform individuals about a health or weight-loss benefit from using stairs, about a nearby opportunity to use stairs, or both. A few examples of the content of the signs include "improve your waistline, use the stairs" or "your heart needs exercise, use the stairs." Point-of-decision signs may be combined with other prompts such as footprints placed to direct individuals to the stairwell; the team considered these additional efforts within this review. Point-of-decision prompts when combined with more elaborate enhancements to the stairs or stairwells, such as painting stairwell walls or playing music in stairwells, are reviewed separately below.

Figure 1. Sample point-of-decision prompt

Effectiveness. The literature search identified 15 studies that assessed the effectiveness of point-of-decision prompts when used alone in changing the frequency or amount of stair use or the number of stair users.[13–27] Four of these studies were rated as having least suitable study designs and were excluded from further analysis.[21–24]

Two of the studies[19,25] were of good execution; the remaining nine[13–18,20,26,27] were rated as fair. One additional paper provided information on a study already included in the review.[28] Details of the 11 qualifying studies, including a summary of the content, delivery, evaluation design, and outcomes, are available at www.thecommunityguide.org/pa/environmental-policy/podp.html.

Study design and implementation characteristics. All 11 qualifying studies used time–series designs, and were rated as being of moderate suitability.[13–20,25–27] All of the qualifying studies were conducted between 1980 and 2003, and measured stair use in adult populations. The types of point-of-decision prompts used in the qualifying studies were signs[13–19,26,27] or banners,[20] which were distinctions used by the authors and not necessarily related to the size of the prompt, although in the one study specifying stair banners, the messages were physically placed on each stair, but like the signs, varied in design and message. The 11 qualifying studies implemented a variety of point-of-decision prompts messages such as health benefits and health promotion,[13,14,16–18,25] weight control,[14] and signs (in Spanish and English) using either an individual or family perspective to specifically target the Hispanic community.[19] One study focused primarily on African-Americans, and the point-of-decision prompt was tailored to this particular community.[15] Additionally, in one study a deterrent sign was displayed that limited the elevator to use by the staff and the physically challenged.[26]

Outcomes Related to Stair Use

Eleven qualifying studies,[13–20,25–27] consisting of 21 study arms for stair use, provided evidence in terms of absolute (i.e., percentage point) change. In these studies, the baseline rates of stair use ranged from 1.7% to 39.7% of potential users (median=8.2, IQI=5.2, 21.2). Stair use during the intervention period in these study arms ranged from 4.0% to 41.9% of potential users. The median change for the 21 study arms representing these studies was an increase in stair use of 2.4 percentage points (IQI=0.83, 6.7 percentage points). Increases in stair use in 15 of 21 study arms were reported as statistically significant,[14–20,22–28] while two study arms (from the same study) reported a significant decrease in stair use.[19]

To examine effects relative to baseline stair use, eleven qualifying studies that included 21 study arms for stair use were evaluated in terms of relative (i.e., percentage) change.[13–20,25–27] The majority of studies reported a low level of baseline stair use (<20%). Overall, in the 11 qualifying studies, the median relative improvement in observed stair use was 50 percentage points (IQI=5.4%, 90.6%) from baseline (Figure 2; note that data points for subpopulations and simple means for the total sample are included on this figure).

The team examined how the effectiveness of point-of-decision prompts, measured in units of absolute change, varied with baseline stair use and found no significant relationship between baseline stair use and absolute change (Spearman's rho= −0.39, n=21 data points, p=0.77).

The team also examined the effectiveness of point-of-decision prompts by the period of observation. Researchers in nine of the studies (representing 18 study arms)[13,17–20,25–27] left point-of-decision prompts in place and observed passersby for different lengths of time, with observation periods ranging from 1 week (relative change=81.1%)[26] to 12 weeks (relative change=5.16%).[25] The period of observation was not reported for two qualifying studies representing three study arms.[14,15] There was no significant relationship between the period of observation and relative change in stair use (Spearman's rho= −0.12, n=18 data points, p=0.65).

Overall, 25 of the 28 data points representing 17 study arms (ten studies) in this body of evidence reported findings in favor of the intervention. For some studies the statistical significance of the results was not reported, and for some, the findings differed by direction for subgroups. Among those studies with findings in favor of the intervention, at the individual level the actual increase in stair use was modest. Because using stairs is a physical activity that can be done by most people in most places where stairs are present, modest increases in stair use among populations of adults across settings (malls, worksites, libraries, and other such facilities) and across time can contribute to or extend bouts of physical activity and may have a positive effect on energy balance.

Applicability. The body of evidence used to evaluate the applicability of this intervention was the same as that used to evaluate effectiveness. Seven studies were conducted in the U.S.,[14,15,17–19,26,27] two were conducted in the United Kingdom,[13,20] and one study each was conducted in Scotland specifically[16] and in Australia.[25] Point-of-decision prompts were evaluated in a range of settings, and two studies investigated the effectiveness of the same intervention in different locations.[18,19] Baseline use of stairs differed across settings (e.g., buildings with single or multiple flights of stairs, public locations and worksites), and the effectiveness of the intervention also varied across settings, suggesting that the goal (e.g., leisure activity or work), or type of dress (e.g., suit or work shoes) of people in certain types of locations may have an impact on the effectiveness of the intervention.

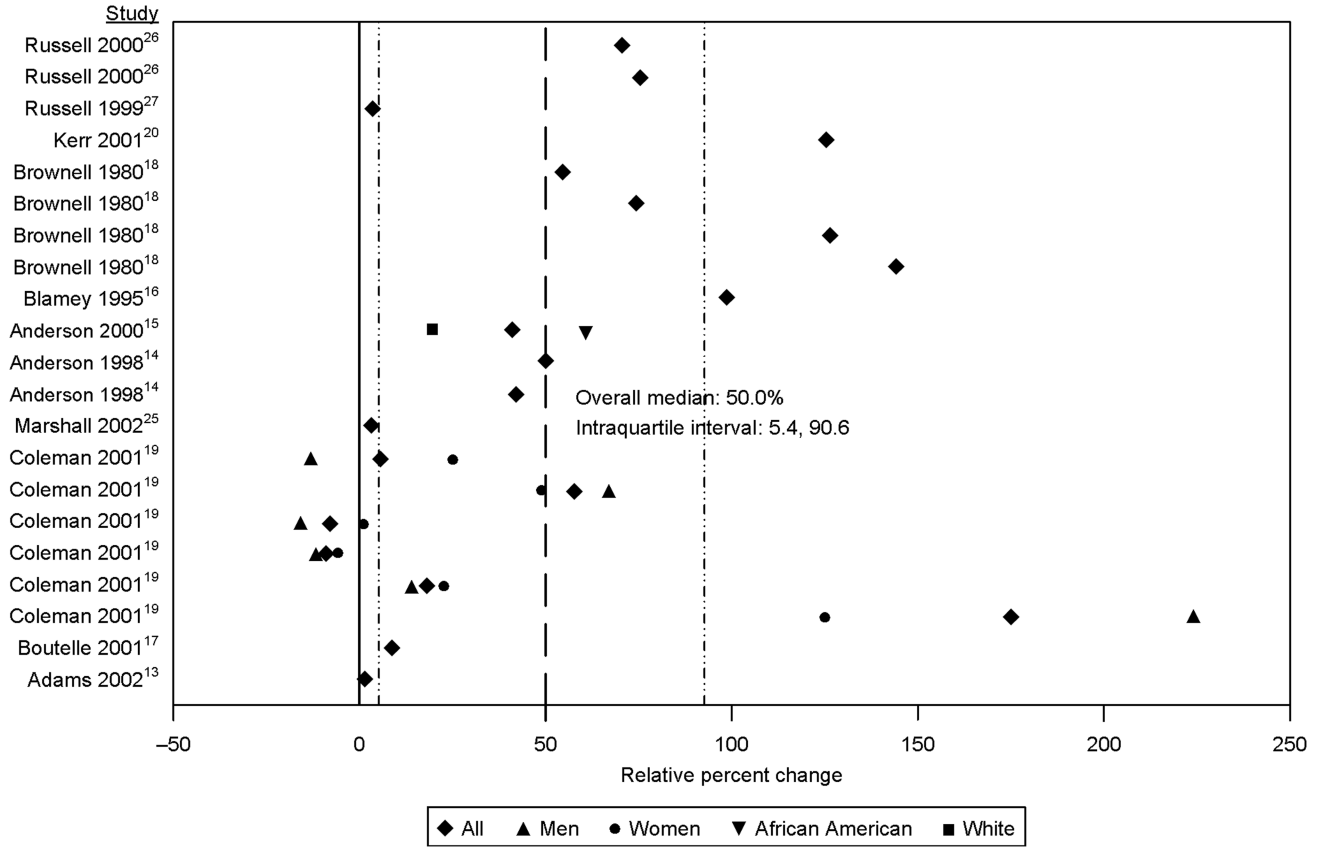

Figure 2. Relative change in percentage of people using stairs when point-of-decision prompts are displayed (n=35 measurements from 21 study arms in 11 qualifying studies). Some studies have multiple study arms so are repeated.

The studies included in this review were conducted in shopping malls,[14,18,20] train and bus stations,[15,16,18] airports,[19,26] an office building,[19] a bank,[19] a healthcare facility,[25] a medical school,[13] a university,[17] and a university library.[19,27] Four studies[13,17,19,25] specified that workers were included among those observed. Although some locations may have had a greater percentage of workers present (e.g., office buildings and universities) than others (e.g., airports and malls), it is likely that workers were present in all places included in this review.

Six studies, representing 13 study arms,[14,16,19,20,26,27] measured effectiveness separately among men and women (median relative percentage change equaled 33% and 48%, respectively) and found that point-of-decision prompts had similar effects for both groups. Additionally, age was measured in five studies representing ten study arms.[14,18,20,26,27] All studies included adult-only samples, and study authors grouped individuals into either young or old adults (median relative percentage change equals 51% and 65%, respectively). Age groupings varied by study with three using age 30 years as a cutoff point for the younger group[14,18,27] and one using age 40 years as a cutoff point for the younger group.[26] Two studies used age 60 years to distinguish between their younger and older groups.[20,27] No studies examined the effectiveness of the intervention in changing the behavior of children or adolescents. Four studies, with eight study arms,[14,15,18,20] measured effectiveness for whites and African Americans and found no difference between racial groups (median relative percentage change=53% for each group). The team therefore believed that this type of intervention is likely to be effective across diverse settings and population groups, provided that the appropriate care is taken to adapt the messages[15,19] for each setting or population. However, stair use may vary according to environmental characteristics (e.g., accessibility of stairs, number of flights to destination, or cleanliness of stairwell) and personal factors (e.g., body composition, presence of children or heavy loads) of the targeted population, which may affect responsiveness to the intervention.

Other positive or negative effects. One study reported nonsignificant changes in elevator use consistent with changes in stair use (lift use decreased as stair use increased),[13] which may result in reduced electricity use and related costs. Potential harms of increased stair use include strains and sprains, as well as injuries due to falls. In addition, one author noted that "posting a sign extol-

ling the benefits of climbing one flight of stairs may convey false information. It may lead people to believe that a single 30-second climb will substantially improve their health."[29]

Economic efficiency. For this updated review, a search of literature on economic effectiveness was conducted. No studies were found that met the requirements for inclusion in a *Community Guide* review.[30]

Barriers to intervention implementation. Few studies reviewed indicated specific barriers to successful implementation of the intervention. One author reported unauthorized removal of prompts from stairwells.[13] Another reported that the floor on which an employee worked affected stair use, suggesting that the more stairs one has to ascend, the less effective the intervention might be.[24] Additionally, some stairwells are locked and others may be difficult to find, poorly lit, or not well maintained.[17] Some institutions may have fire codes and other policies restricting the placement of prompts or posters in public areas. Choice of dress (e.g., high-heeled shoes) may also serve as barriers to stair use and may increase general risk of using the stairs.

Summary and Discussion: Effectiveness of Point-of-Decision Prompts

In general, the qualifying studies identified in this review reported a low level of observed baseline use of stairs, and small but significant increases in the use of stairs following the implementation of point-of-decision prompts. Although absolute changes were small, these differences represent modest relative improvements in the use of stairs. In general, the lower the level of baseline use, the greater the improvements in use. The duration of observation reported in the qualifying studies was relatively short, with a maximum observation period of 12 weeks. The team had little evidence with which to evaluate the long-term impact of these interventions on stair use, and there was no significant association between length of observation periods and changes in stair use.

The venue in which the prompt is placed may also influence the amount of exposure. Some locations, such as malls and airports, have populations that (with the exception of a limited number of employees) likely do not return from one day to the next; whereas other locations, such as office buildings and commuter train stations, likely have populations that return—and therefore are exposed to the prompts—day after day. None of these studies examined the impact that repeated exposure to prompts may have on stair use—clearly an area for future research.

Conclusion

According to *Community Guide* rules of evidence,[7] this review provides strong evidence that point-of-decision prompts contribute to modest increases in the percentage of people choosing to take the stairs rather than an elevator or escalator. The observed increases in the use of stairs may contribute to a modest improvement in daily physical activity that would have a cumulative effect on caloric expenditure and, in turn, energy balance.

Review of Evidence: Stair or Stairwell Enhancements when Combined with Point-of-Decision Prompts

Enhancement of stairs or stairwells when combined with point-of-decision prompts was also examined as part of this update review. This intervention includes modifying stairwells through one or more of the following: painting walls, laying carpet, adding artwork, and playing music. This intervention may indirectly increase the effectiveness of point-of-decision prompts by changing attitudes about stair use (or a particular stairwell).

Effectiveness. The team identified two studies[17,31] that assessed the effectiveness of stairwell enhancements when combined with point-of-decision prompts in changing frequency of stair use, as measured by mean number of trips per person per day and percentage of people using the stairs. Both of these studies used time–series designs, were rated as moderate in suitability, and were evaluated as being of fair execution. Details of the two qualifying studies, including a summary of the content, delivery, evaluation design, and outcomes, are available at www.thecommunityguide.org/pa/environmental-policy/podp.html.

Study design and implementation characteristics. Both studies reviewed investigated the impact of environmental change on stair use. One study[31] reported a long-term evaluation during which a stairwell was painted and carpeted, artwork was placed on the walls of landings, point-of-decision prompts were posted throughout the building and on the computer kiosk in the lobby, and finally, music was piped in. This intervention was implemented in stages where cumulative effects were examined (effectiveness was evaluated after new carpet and paint were added, and then again after adding artwork). In the second study, the effectiveness of prompts alone and the effectiveness of prompts plus adding artwork and music to the stairwell were examined.[17] For this study, the prompts-alone condition was included in the review described above. One study was conducted in an office building[31] and the other was conducted in a university building.[17] Both studies were conducted in the U.S.

Outcomes related to stair use. There was not enough evidence in this body of literature to draw conclusions about effectiveness. In the study conducted in an office building, all interventions (paint, carpet, art, signs, and music) together led to a relative increase in stair use of 8.8% (baseline use: M=2.14 trips per day per occupant).[31] The other study examined the effectiveness of point-of-decision prompts with artwork and music and reported a 39.6% relative increase in stair use (percentage of people using stairs at baseline: 11.1%).[17]

Barriers to intervention implementation. Fire code regulations may limit or preclude enhancements to stairs and stairwells. The qualifying studies did not provide additional information on barriers to implementation of these interventions.

Conclusion

According to the *Community Guide's* rules of evidence,[7] there is insufficient evidence to determine the effectiveness of point-of-decision prompts in encouraging stair use when combined with stair or stairwell enhancements. Two studies of moderate suitability were identified. Although both observed improvements in stair use over the period of observation (relative percentage changes of 8.8% in trips per person per day and 39.6% of people using the stairs), more research is needed to determine the effects of this intervention on stair use.

Research Issues

Informational approaches to increasing physical activity.

Effectiveness. This review established the effectiveness of point-of-decision prompts to encourage stair use. However, important research issues regarding the effectiveness of these interventions remain. Many research questions from the first *Community Guide* review of point-of-decision prompts[5] have been addressed in more recent studies. However, some questions have not been addressed and others emerged from this update.

- What effect does varying the message or format of the prompt have on providing a "booster" to stair use among the targeted population?
- What type of prompt is most effective? What effect does format or size have, if any?
- Is there a "critical distance" from the elevator or escalator to the stairs, in which the effect of signage on stair use is reduced?
- Are there a minimum or maximum number of flights one must expect stair users to ascend in order for the prompt to be effective?
- How many individuals read the point-of-decision prompt and react (i.e., increase their use of the stairs) as a result, as opposed to reacting to other knowledge that the intervention is occurring?
- What strategies can be used to maintain the intervention effect after the intervention ends? Are periodic "boosters" necessary or helpful?

Economic evaluations. The available economic data were limited. Therefore, considerable research is warranted on the following questions.

- What is the cost effectiveness of each of these seemingly low-cost interventions?
- How can effectiveness in terms of health outcomes or quality adjusted health outcomes be better measured, estimated, or modeled?

Summary

In this article, the team reported results from an updated review of point-of-decision prompts that included an additional review of stair or stairwell enhancements when used with point-of-decision prompts. The inclusion of more recent studies provides strong evidence of effectiveness of the point-of-decision prompt intervention in increasing the use of stairs. On average these improvements represent a modest improvement in stair use. Point-of-decision prompts may represent a simple, lower-cost option to increase physical activity in some settings. There was insufficient evidence to draw a conclusion regarding the effectiveness of stair or stairwell enhancements when used with point-of-decision prompts. Despite the inclusion of additional studies, there remain important gaps in understanding of the effectiveness of these interventions in some settings (such as worksites), and the contribution of these interventions to overall physical activity and physical fitness.

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The names and affiliations of the Task Force members are listed in the front of this supplement and at www.thecommunityguide.org.

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References

1. Ogden CL, Carrol MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the U.S., 1999–2004. JAMA 2006;295(13):1549–55.
2. CDC. Overweight and obesity: an overview. www.cdc.gov/nccdphp/dnpa/obesity/contributing_factors.htm.
3. USDHHS. The Surgeon General's call to action to prevent and decrease overweight and obesity. www.surgeongeneral.gov/topics/obesity/.
4. U.S. Preventive Services Task Force. Guide to Clinical Preventive Services: report of the U.S. Preventive Services Task Force. 2nd ed. Baltimore: Williams & Wilkins, 1996.
5. Kahn EB, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity: a systematic review. Am J Prev Med 2002;22(4S):S73–107.
6. Task Force on Community Preventive Services. Recommendations to increase physical activity in communities. Am J Prev Med 2002;22(4S):S67–72.
7. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services—methods. Am J Prev Med 2000;18(1S):S35–43.
8. Lanningham-Foster L, Nysse LJ, Levine JA. Labor saved, calories lost: the energenic impact of domestic labor-saving devices. Obes Res 2003;11(10):1178–81.
9. Teh KC, Aziz AR. Heart rate, oxygen uptake, and energy cost of ascending and descending the stairs. Med Sci Sports Exerc 2002;34(4):695–9.
10. Boreham CAG, Wallace WFM, Nevill A. Training effects of accumulated daily stair-climbing excercise in previously sedentary young women. Prev Med 2000;30:277–81.
11. Benn SJ, McCartney N, McKelvie RS. Circulatory responses to weight lifting, walking, and stair climbing in older males. J Am Geriatr Soc 1996;44(2):121–5.
12. Zaza S, Wright-De Aguero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. Am J Prev Med 2000;18(1S):44–74.
13. Adams J, White M. A systematic approach to the development and evaluation of an intervention promoting stair use. Health Educ J 2002;61(3):272–86.
14. Andersen RE, Franckowiak SC, Snyder J, Bartlett SJ, Fontaine KR. Can inexpensive signs encourage the use of stairs? Results from a community intervention. Ann Intern Med 1998;129(5):363–9.
15. 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;32:38.
16. Blamey A, Mutrie N, Aitchison T. Health promotion by encouraged use of stairs. Br Med J 1995;311(7000):289–90.
17. Boutelle KN, Jeffery RW, Murray DM, Schmitz MK. Using signs, artwork, and music to promote stair use in a public building. Am J Public Health 2001;91(12):2004–6.
18. Brownell KD, Stunkard AJ, Albaum JM. Evaluation and modification of exercise patterns in the natural environment. Am J Psychiatry 1980;137(12):1540–5.
19. Coleman KJ, Gonzalez EC. Promoting stair use in a U.S.–Mexico border community. Am J Public Health 2001;91(12):2007–9.
20. Kerr J, Eves F, Carroll D. Getting more people on the stairs: the impact of a new message format. J Health Psychol 2001;6(5):495–500.
21. Kerr J, Eves F, Carroll D. Encouraging stair use: stair-riser banners are better than posters. Am J Public Health 2001;91(8):1192–3.
22. Kerr J, Eves F, Carroll D. Posters can prompt less active people to use the stairs. J Epidemiol Community Health 2000;54(12):942–3.
23. Kerr J, Eves FF, Carroll D. The influence of poster prompts on stair use: the effects of setting, poster size and content. Br J Health Psychol 2001;6(Pt 4):397–405.
24. Kerr J, Eves F, Carroll D. Can posters prompt stair use in a worksite environment? J Occup Health 2001;43(4):205–7.
25. Marshall AL, Bauman AE, Patch C, Wilson J, Chen J. Can motivational signs prompt increases in incidental physical activity in an Australian healthcare facility? Health Educ Res 2002;17(6):743–9.
26. Russell WD, Hutchinson J. Comparison of health promotion and deterrent prompts in increasing use of stairs over escalators. Percept Mot Skills 2000;91(1):55–61.
27. Russell WD, Dzewaltowski DA, Ryan GJ. The effectiveness of a point-of-decision prompt in deterring sedentary behavior. Am J Health Promot 1999;13(5):257–9.
28. Kerr J, Eves F, Carroll D. Six-month observational study of prompted stair climbing. Prev Med 2001;33(5):422–7.
29. Reisman A, Gross CP. Increasing stair use. Ann Intern Med 1999;130(7):616–7.
30. Carande-Kulis VG, Maciosek MV, Briss PA, et al. Methods for systematic reviews of economic evaluations for the Guide to Community Preventive Services. Am J Prev Med 2000;18(1S):S75–91.
31. Kerr NA, Yore MM, Ham SA, Dietz WH. Increasing stair use in a worksite through environmental changes. Am J Health Promot 2004;18(4):312–5.