



Journal of Articles in Support of the Null Hypothesis

Vol. 10, No. 1

Copyright 2013 by Reysen Group. 1539-8714

www.jasnh.com

Examining the Effects of a Health Promotion Intervention on the Use of Stairs

Shannon Munro Cohen

Department of Veterans Affairs Medical Center, Salem, Virginia

Using stairs is one way to increase daily physical activity and reduce cardiovascular risk. Multiple studies have found that individuals' use of stairs can be impacted by signage, point of decision prompts, and education. Poisson regression was used to examine the effect of interventions on stair usage at several time intervals. Despite previous compelling research and an initial spike in stair usage, there was not enough evidence to state whether the interventions impacted long term stair usage. Although this study did not find a significant change over time, participants enthusiastically participated during the intervention period. It is hoped that participants gained a greater awareness of the small lifestyle choices that can lead to improved health and will choose the stairs more often.

Author Note:

The opinions expressed herein are those of the author and do not necessarily reflect those of the Department of Veterans Affairs Medical Center, the U.S. Government, or any of its agencies. This material is the result of work supported with resources and the use of facilities at the Department of Veterans Affairs Medical Center in Salem, Virginia. The researcher is grateful for the financial support of the Salem Research Institute for the purchase of the people counters, Joe Woolwine who designed, made, and hung the point of choice decision prompts, Darren Epperly who maintained the equipment, and the research assistance of Dr. Sarah Hartley, psychologist.

Even modest changes in health behavior have the potential for public health significance. This health promotion campaign including point of decision prompt signage and education was designed to increase stair usage at the Department of Veterans Affairs Medical Center (VAMC) in Salem, Virginia. By increasing stair usage, it was hoped that the intervention would improve participants' overall activity level and cardiovascular fitness. Cardiovascular disease is the number one cause of death in the United States (U.S.), and regular physical activity is recognized as one of the most beneficial behaviors to improve one's health (Artinian et al., 2010; Meyer et al., 2010). Over 75 billion dollars is spent annually in direct medical costs of inactivity in the U.S. (Artinian et al., 2010). Coupled with poor dietary choices and excess body weight, inactivity significantly increases the risk of cardiovascular disease, diabetes, and other disorders (Artinian et al., 2010). Therefore the Centers for Disease Control and Prevention, the American Heart Association, the U.S. Department of Health and Human Services and others recommend increasing physical activity to enhance health and reduce mortality risk. The benefits of regular physical activity, such as stair climbing, include the following (Bize & Plotnikoff, 2009; Centers for Disease Control and Prevention, 2008; Nomura, Yoshimoto, Akezaki, & Sato, 2009; Wise, 2010):

- Reducing cardiovascular risk and premature mortality
- Achieving and maintaining a healthy weight
- Improving bone health and muscular strength
- Reducing blood pressure and decreasing insulin resistance
- Increasing high density lipoprotein and decreasing triglyceride levels
- Enhancing the quality of sleep and increasing perceived quality of life
- Reducing feelings of low energy and mood
- Increasing overall activity level, fitness, and exercise capacity
- Giving older adults a greater opportunity to live independently in the community.

Barriers to physical activity may include the following (CDC, 2011; Dunton & Schneider, 2006):

- Lack of time or energy
- Limited social support or finances
- Fear of injury
- Lack of skill
- Weather conditions
- Low level of motivation
- Travel
- Family obligations
- Concern about appearance or safety
- Special footwear and clothing required

The American Heart Association recommends that employers develop workplace policies that encourage optimal health including both short- and long-term plans to meet the physical activity needs of employees (Artinian et al., 2010; Fletcher et al., 1996). Studies have shown that worksite programs that develop a comprehensive approach to employee health are effective in improving coronary risk factors, and reducing absenteeism, accidents, healthcare costs, hospital admissions, and days of rehabilitation (Anderson et al., 2009; Bly, Jones, & Richardson, 1986).

The Centers for Disease Control and Prevention (2010) and the U.S. Department of Health and Human Services (2011) recommend that employers encourage workers to take the stairs rather than an escalator or elevator and promote increased aerobic exercise as one of the Healthy People 2020 goals. Short bursts of activity such as stair climbing throughout the day provide health benefits among previously sedentary personnel and should be encouraged (Boreham et al., 2005; Kennedy, Boreham, Murphy, Young, & Mutrie, 2007). Some may argue that a one-time use of the stairs is unlikely to significantly impact one's health but repeated use of the stairs in the workplace has the potential to improve the health of employees who utilize them (Eves, Olander, Webb, Griffin, & Chambers, 2012). Likewise Sattelmair et al. (2011) and Boreham, Wallace, and Nevill (2000) point out that any increase in physical activity is better than no exercise and that exercise is beneficial in reducing cardiovascular risk.

Stair climbing is considered an efficient, well-tolerated yet vigorous aerobic activity sufficient to improve cardiovascular fitness, even in as little as 10 minutes a day (Boreham et al., 2005; Teh & Aziz, 2002; Meyer, Kayser, & Mach, 2009; Meyer et al., 2010). Stair climbing is an inexpensive intervention that can be encouraged in any workplace with important implications for public health (Boreham et al., 2005). Indoor stair climbing can be done regardless of the weather without purchasing any special equipment or clothing.

Meyer et al. (2010) did a 12 week promotional campaign for stair use at the University Hospital of Geneva and found significant increases in participant activity level and declines in weight (mean 1.2 pounds per person lost) and waist circumference (mean decrease by 1.5 cm), body fat percentage, diastolic blood pressure, and low density lipoprotein. Six months after this intervention, improvement in estimated maximal aerobic capacity (measured by the Chester step test) and reduction in body fat percentage persisted.

Researchers at Harvard found that individuals who climbed stairs daily at work had a 25% decreased risk of mortality compared to those who were less active (Froelicher & Meyers, 2006). Eves, Webb, and Mutrie (2006) reported that climbing stairs burns more calories than jogging, and people who are overweight or less fit consider it an acceptable form of exercise. Webb and Cheng (2010) found that overweight individuals were more likely to climb the stairs when the point of choice prompts were related to weight loss, and reported that climbing stairs was one way for these individuals to obtain exercise with less concern about their appearance and ability.

Multiple studies have found that stair usage is increased by point of choice prompt signage with educational information regarding the health and weight control benefits of stair climbing (Andersen, Franckowiak, Snyder, Bartlett, & Fontaine, 1998; Artinian et al., 2010; Blamey, Mutrie, & Aitchison, 1995; Coleman & Gonzalez, 2001; Kahn et al., 2002; Nomura et al., 2009; Olander & Eves, 2011; Soler et al., 2010; Task force on community preventive services 2002; Task force on community preventive services 2005). Lewis and Eves (2012) found that point of choice prompts near the stairs plus signs at the top of the climb were more effective together than separate.

The CDC found that a passive intervention, StairWELL to Better Health, increased stairwell use among business center occupants (Kerr, Yore, Ham, & Dietz, 2004). Interventions have also been shown to influence stairwell usage in shopping centers, university buildings, and medical centers (Andersen et al., 1998; Boutelle, Jeffrey, Murray & Schmitz, 2001; Webb & Eves, 2007). In 2010, at the Dayton Ohio VAMC, Kimberly Frisco and her colleagues found that adding signage, wall murals, and satellite radio to the stairwells increased employee stairwell usage by 20%.

The U.S. Office of Personnel Management (OPM, 2009) identifies four pillars of employee wellness: physical activity, tobacco cessation, stress mastery, and healthy eating. The physical activity component includes making exercise part of employees' daily routine. In 2007, the OPM, U. S. Department of Health and Human Services, and the President's Council on Physical Fitness and Sports sponsored a Physical Activity Challenge with the purpose of promoting health by facilitating positive changes in physical activity levels, behaviors, and related attitudes and motivation. The results of a follow-up study with employee participants indicate that worksite programs such as "The HealthierFeds Physical Activity Challenge" help emphasize the importance of health in the workplace, provide a supportive atmosphere among coworkers engaged in similar activities, help employees fit physical activity into their lives, and deliver programs that promote positive change to large groups of people in a streamlined way (OPM, 2009).

Method

The objective of this intervention was to increase awareness of the effects of physical activity on health. This study was a pre and post intervention time series design. The study examined the effects of a 6 week health promotion campaign on use of stairs at the VAMC in Salem, Virginia. Poisson regression was used as the dependent variable was a count. The researchers assumed this was essentially the same population (of primarily employees working in adjacent areas) pre and post and tested the correlation between stair use and the intervention. Poisson regression is a special case of the Generalized Linear Model, adjusts for skewness through a log transformation, and is often used to model information on counts and can be used when the events are rare or when there are multiple events per person. This method is particularly useful in situations where there is no natural denominator, and thus no limit on how large an observed count can be.

The stairwell chosen was picked due to its connection between the outpatient clinics, pharmacy, and physical therapy department and the main hospital and laboratory. The stairwell chosen for this study did not require key entry on any of the floors unlike other stairwells in the facility that could have been chosen. Only one set of electronic people counters was available thus only one stairwell was studied. An average of 3,900 people enter the front door of this building daily.

Participation in using the stairs was completely voluntary. Baseline stair usage was assessed using an electronic people counter placed at each entrance to one set of stairs at the facility. Five weeks of initial stair monitoring allowed researchers to determine a pre-intervention baseline and habituate staff to the presence of the electronic people counters. Stair climbing was encouraged during weeks 6-12 of the study through educational emails to staff, introduction of point of choice decision prompt signs on week 6 (the signs remained in place throughout the entire study) and a stairwell "grand re-opening," as well as a contest to "catch" and reward employees taking the stairs with a small prize worth less than \$5. The point of choice decision prompt signs were placed on all of the stairwells on campus.

The research question for this study was adapted from the Guide to Community Preventive Services (U.S. Department of Health & Human Services, 2011): Does the health promotion intervention (point-of-decision prompt signs and education) increase stair use among participants at the VAMC in Salem, Virginia?

Results

This study utilized Poisson regression to examine the effect of a health promotion intervention on stair usage at several time intervals. Despite previous compelling research and an initial spike in stair usage during the intervention phase, there was not enough evidence in this study to state whether the intervention impacted stair usage over the long term. As the overall regression model was not statistically significant (Wald $\chi^2 = 7.34, p = 0.08$), the model was not investigated further. In Figure 1 the average daily stair usage for each week is presented. A baseline of activity was kept for the first five weeks. The stairwell “grand re-opening” was held on week 6 with additional focused intervention between weeks 6 to 12. The point of choice prompts signs were installed at the beginning of week six and remained in place for the duration of the study. The final spike in stair use is presumed to be due to the return of students after their winter break and the reopening of outpatient clinics after the holidays. High levels of stair climbing activity noted during the initial monitoring stage, prior to intervention, were presumably due to maintenance staff adjusting the equipment and/or staff noticing that stairwell use was being tallied. See Table 1 for the means and standard deviations for this study.

Figure 1: Average daily stair usage during the study period.

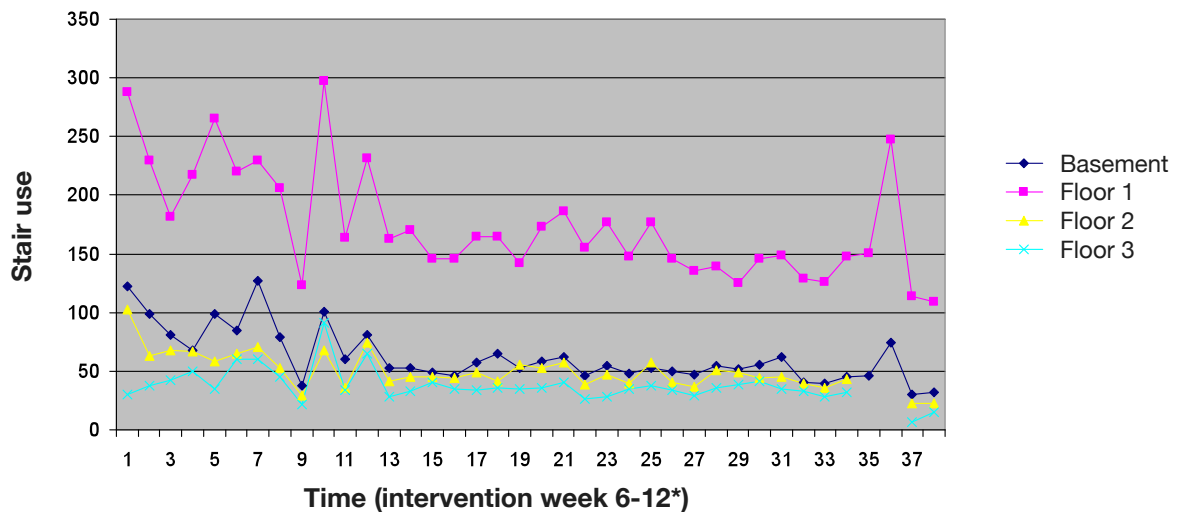


Table 1: Descriptives on Daily Stair Usage.

Event		Basement	1 st floor	2 nd floor	3 rd floor
Monitoring period before intervention	Mean	89.37	228.82	69.09	44.84
	SD	16.07	31.66	12.78	10.35
Intervention period (6-12 weeks)	Mean	89.93	231.53	61.53	62.37
	SD	24.77	51.36	14.67	21.94
Sustained period (6 months following intervention)	Mean	51.73	151.46	45.19	34.02
	SD	7.31	18.22	7.29	5.51
Total	Mean	67.87	185.01	53.58	42.75
	SD	24.00	50.22	14.59	16.92

Discussion

Strengths of the study included the long follow up period after the intervention and the use of electronic people counting devices for the stair counts. Limitations included the monitoring of only one stairwell on a very large medical center campus, and the inability to generalize findings to a civilian or other type of setting. During two weeks near the end of the study, data was lost on two floors due to equipment malfunction. Stair counts were clearly impacted by the presence and absence of medical and nursing students who were noted to frequently use the stairs with and without their instructors. Stair counts dropped during holidays when there were fewer staff on duty and during periods of extreme heat when the stairwell became uncomfortably warm. The first floor doorway consistently saw the most traffic due to its proximity to the operating room.

Stair climbing is a vigorous aerobic activity which accumulates with multiple short climbs over the course of the day and can improve cardiovascular fitness and activity levels for most individuals. Stair climbing is convenient and generally well tolerated, but may prove too challenging for participants with orthopedic or other physical limitations and/or a low baseline level of fitness.

In this study, staff members received education about the benefits of physical activity through stair climbing and the “grand re-opening” of the stairwell and contest called attention to our health promotion efforts. Promotion of this form of exercise is inexpensive; Point of choice decision signs cost less than \$100 and were considered very effective in previous research studies. Decision prompts placed near stairwells were visible to people walking by and suggest changing a behavior where that behavior occurs. Signs encouraged people to consider a change in their health behavior, however, follow through depends on their motivation to become more physically active. As many have pointed out before us, intention to change may not translate into a long term health behavior change (Olander & Evans, 2011).

In this study we were unable to determine what percentage of our target audience was reached through our efforts or whether the audience considered our efforts effective. Although this study did not find a significant long term change in stair usage over the six month period following intervention, many employees enthusiastically participated during the intervention period. Many participants commented to researchers how much they appreciated the efforts of the VAMC to improve their health and wellbeing. Results of the study will be used to develop strategies for additional health promotion campaigns related to exercise. Researchers recommend the addition of murals within the stairwells which have been successfully employed at other VAMC and adequate cooling systems in place in the stairwells. It is hoped that our participants have a greater awareness of the small lifestyle choices made every day that can lead to improved health and given the opportunity will choose the stairs more often.

References

- Andersen, R. E., Franckowiak, S. C., Snyder, J., Bartlett, S. J., & Fontaine, K. R. (1998). Can inexpensive signs encourage the use of stairs? Results from a community intervention. *Annals of Internal Medicine*, *129*, 363-369.
- Anderson, L. M., Quinn, T. A., Glanz, K., Ramirez, G., Kahwati, L. C., Johnson, D. B... Katz, D. L. (2009). Task Force on Community Preventive Services. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: A systematic review. *American Journal of Preventive Medicine*, *37*, 340-357.
- Artinian, N. T., Fletcher, G. F., Mozaffarian, D., Kris-Etherton, P., Van Horn, L., Lichtenstein, A. H. ...Burke, L. E. (2010). Intervention to promote physical activity and dietary lifestyle changes for cardiovascular risk reduction in adults: A scientific statement from the American Heart Association. *Circulation*, *122*, 406-441.
- Bize, R., & Plotnikoff, R. C. (2009). The relationship between a short measure of health status and physical activity in a workplace population. *Psychology, Health, and Medicine*, *14*, 53-61.
- Blamey, A., Mutrie, N., & Aitchison, T. (1995). Health promotion by encouraged use of stairs. *British Medical Journal*, *311*, 289-290.
- Bly, J. L., Jones, R. C., & Richardson, J. E. (1986). Impact of worksite health promotion on health care costs and utilization: Evaluation of Johnson & Johnson's Live for Life Program. *Journal of the American Medical Association*, *256*, 3235-3240.
- Boreham, C. A., Wallace, W. F., & Nevill, A. (2000). Training effects of accumulated daily stair climbing exercise in previously sedentary young women. *Preventive Medicine*, *30*, 277-281.
- Boreham, C. A., Kennedy, R. A., Murphy, M. H., Tully, M., Wallace, W., & Young, I. (2005). Training effects of short bouts of stair climbing on cardiorespiratory fitness, blood lipids, and homocysteine in sedentary young women. *British Journal of Sports Medicine*, *39*, 590-593.
- Boutelle, K. N., Jeffery, R. W., Murray, D. M., & Schmitz, K. H. (2001). Using signs, artwork, and music to promote stair use in a public building. *American Journal of Public Health*, *91*, 2004-2006.
- Centers for Disease Control and Prevention (2011). Overcoming barriers to physical activity. Retrieved from: <http://www.cdc.gov/physicalactivity/everyone/getactive/barriers.html>
- Centers for Disease Control and Prevention. (2010). State indicator report on physical activity, 2010. U.S. Department of Health and Human Services. Retrieved from: http://www.cdc.gov/physicalactivity/downloads/PA_State_Indicator_Report_2010.pdf
- Centers for Disease Control and Prevention. (2008). Physical activity. In Guide to Community Preventive Services Web site. Retrieved from: <http://www.thecommunityguide.org/pa>.
- Coleman, K. J., & Gonzalez, E. C. (2001). Promoting stair use in a U.S. - Mexico border community. *American Journal of Public Health*, *91*, 2007-2009.
- Dunton, G., & Schneider, M. (2006). Perceived barriers to walking for physical activity. Preventing Chronic Disease, *3*. Retrieved from: http://www.cdc.gov/pcd/issues/2006/oct/05_0185.htm
- Eves, F. F., Olander, E. K., Webb, O. J., Griffin, C., & Chambers, J. (2012). Likening stairs in buildings to climbing a mountain: Self reports of expected effects on stair climbing and objective measures of effectiveness. *Psychology of Sport and Medicine*, *13*, 170-176.
- Eves, F. F., Webb, O. J., & Mutrie, N. (2006). A workplace intervention to promote stair climbing: Greater effects in the overweight. *Obesity*, *14*, 2210-2216.
- Fletcher, G. F., Balady, G., Blair, S. N., Blumenthal, J., Caspersen, C., Chaitman, B. ...Pollock, M. L. (1996). Statement on exercise: Benefits and recommendations for physical activity programs for all Americans. *Circulation*, *94*, 857-862.
- Frisco, K. (2010). *Stairwell to wellness*. Poster presentation at the 2010 Federal Occupational Health and Workers' Compensation Conference, Sacramento, CA.
- Froelicher, V. F., & Meyers, J. (2006). *Exercise and the heart* (5th ed.). Philadelphia, PA: Saunders.
- Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E. ... Corso, P. (2002). The effectiveness of interventions to increase physical activity. *American Journal of Preventive Medicine*, *22*, 73-107.
- Kennedy, R. A., Boreham, C., Murphy, M., Young, I., & Mutrie, N. (2007). Evaluating the effectiveness of a low volume stair climbing programme on measures of health related fitness in sedentary office workers. *Journal of Sports Science and Medicine*, *6*, 448-454.

- Kerr, N. A., Yore, M. M., Ham, S. A., & Dietz, W. H. (2004). Increasing stair use in a worksite through environmental changes. *American Journal of Health Promotion, 18*, 312-315.
- Lewis, A. L., & Eves, F. F. (2012). Testing the theory underlying the success of point of choice prompts: A multi component stair climbing intervention. *Psychology of Sport and Exercise, 13*, 126-132.
- Nomura, T., Yoshimoto, Y., Akezaki, Y., & Sato, A. (2009). Changing behavioral patterns to promote physical activity with motivational signs. *Environmental Health and Preventive Medicine, 14*, 20-25.
- Meyer, P., Kayser, B., & Mach, F. (2009). Stair use for cardiovascular disease prevention. *European Journal of Cardiovascular Disease Prevention, 16*, S17-S18.
- Meyer, P., Kayser, B., Kossovsky, M. P., Sigaud, P., Carballo, D., Keller, P. ...Mach, F. (2010). Stairs instead of elevators at workplace: Cardioprotective effects of a pragmatic intervention. *The European Society of Cardiology, 17*, 569-75.
- Olander, E. K., & Eves, F. F. (2011). Effectiveness and cost of two stair-climbing interventions? Less is more. *American Journal of Health Promotion, 25*, 231-6.
- Sattelmair, J., Pertman, J., Ding, E. L., Kohl, H. W., Haskell, W., & Lee, I. M. (2011). Dose response between physical activity and risk of coronary heart disease: A meta-analysis. *Circulation, 124*, 789-95.
- Soler, R. E., Leeks, K. D., Buchanan, L. R., Brownson, R. C., Heath, G. W., & Hopkins, D. H. (2010). Point of decision prompts to increase stair use: A systematic review update. *American Journal of Preventive Medicine, 38*, S292-S300.
- Task force on community preventive services. (2002). Recommendations to increase physical activity in communities. *American Journal of Preventive Medicine, 22*, 67-72.
- Task Force on Community Preventive Services. (2005). Physical activity. In S. Zaza, P. A. Briss, & K. W. Harris (Eds.), *The guide to community preventive services: What works to promote health?* (pp. 80-113). Atlanta, GA: Oxford University Press.
- Teh, K. C., & Aziz, A. R. (2002). Heart rate, oxygen uptake, and energy cost of ascending and descending the stairs. *Medicine and Science in Sports and Exercise, 34*, 695-699.
- U.S. Office of Personnel Management. (2009). HealthierFeds physical activity challenge: Results from the twelve month follow-up survey. Retrieved from: http://www.healthierfeds.gov/healthierfeds_initiative/reports/HealthierFedsReport_3_9_09.pdf
- U.S. Department of Health & Human Services. (2011). Guide to community preventive services. Environmental and policy approaches to increase physical activity: Creation of enhanced access to places for physical activity combined with informational outreach activities. Retrieved from: <http://www.thecommunityguide.org/pa/environmental-policy/improvingaccess.html>.
- Webb, O. J., & Eves, F. F. (2007). Effects of environmental changes in a stair climbing intervention: generalization to stair descent. *American Journal of Health Promotion, 22*, 38-44.
- Webb, O. J., & Cheng, T. F. (2010). An informational stair climbing intervention with greater effects in overweight pedestrians. *Health Education Research, 25*, 936-944.
- Wise, F. M. (2010). Coronary heart disease: The benefits of exercise. *Australian Family Physician, 39*, 129-133.

Correspondence should be addressed to:

Dr. Shannon Cohen

Email: Shannon.cohen@va.gov

Received: 2.16.2013

Revised: 3.24.2013

Accepted: 3.24.2013