

Factors linked to energy conservation practices, recall of energy conservation messages, and stair use among university students

Somya Mullanpudi¹, Michele Mouttapa², Shari McMahan³

¹MPH, Cal State Fullerton, Dept of Health Science, 800 North State College Blvd. Fullerton, CA- 92834, USA

²Associate Professor, Cal State Fullerton, Dept of Health Science, 800 North State College Blvd. Fullerton, CA-92834-9480, USA

³Deputy Provost Operations, Cal State Fullerton, 800 North State College Blvd. Fullerton, CA-92834, USA

somyamullanpudi@gmail.com¹, mmouttapa@fullerton.edu², smcmahan@fullerton.edu³

Abstract

Objectives: Elevators consume a sizeable amount of energy. This study determines the characteristics of those who: (i) already engaged in various energy saving strategies at home, (ii) were willing to learn more about energy saving strategies and (iii) correctly recalled a poster containing an energy conservation message.

Method: Copies of the posters were placed near elevators on each floor of two multistory university campus buildings. A convenience sample of students who frequented these buildings completed a self-administered questionnaire.

Results: Correct recall of the poster was 20.8%. Older age was associated with using the stairs more frequently, and more years of schooling was associated with showering for less than 10 minutes. Those who recalled the poster correctly reported using the elevator more frequently and turning off the TV when not in use. Those who could improve their energy conservation practices appeared to have better poster recall. Further suggestions are provided.

Keywords: Stair use, Elevator use, Energy conservation, Motivational signage.

1. Introduction

1.1. Obesity and physical activity

The "Freshman 15" is a term which refers to the number of pounds that on an average, a student gains, in first year of college[1]. This might soon become 30 or 45 pounds; with obesity becoming an increasing problem among US adolescents [1].

Thirty minutes of moderate level physical activity on most or all days in a week has been recommended by the American College of Sports Medicine and the Centers for Disease Control and Prevention[2,3]. The recommended levels of physical activity can be accumulated in a day[4-6]. Physical activity decreases the risk not only of obesity, but cardio- respiratory diseases, type 2 diabetes mellitus, stroke, and some cancers[7].

1.2. Climbing stairs: An effective physical activity

Climbing stairs is a useful method to accumulate minutes of physical activity[4]. A prospective study of middle aged men demonstrated that climbing stairs for just seven minutes per day led to a corresponding decrease in coronary heart disease by nearly 67%[4]. Customary use of stairs not only leads to enhanced physical fitness and vigor [8], reduction in weight [5,8], but also decreases blood cholesterol and osteoporosis [5,6,7,8].

1.3. Motivational signage and stair case use

Motivational signage is a visual cue with a tagline that can create awareness about a particular topic, such as benefits of using stairs instead of the elevator. Studies found that aesthetic modifications, artwork, music and motivational signage can enhance stair use[9,10]. However, some of these strategies can be expensive. Motivational signage alone can increase stair use among overweight individuals[4], on college campus buildings[1], across all age groups, especially among whites[2]. Motivational signage at a Scottish subway station had also increased stair use, with sustained effects two weeks after removing the signs [11].

1.4. Present study objectives

The previous studies mentioned demonstrate that motivational signage used to increase physical activity by using stairs rather than elevators has been efficacious. However little is known about the feasibility of increasing stair use by utilizing motivational signage that contains an energy conservation message. Elevators in general use about three to five percent of energy in new buildings [12]. Operating elevators in general for a hydraulic elevator can cost close to \$2,000/year, and many universities with several multistory buildings can incur significant expenses. Promoting the use of stairs may conserve energy costs for universities, while also being a source of physical activity and weight control for students.

The purpose of this pilot study was to determine the characteristics of those who (i) already engaged in various energy saving strategies at home, (ii) were willing to learn more about energy saving strategies, and (iii) correctly recalled the details of posters containing energy conservation messages. The findings of this study were meant to inform the literature about the general level of readiness the college student population has to engage in energy conservation practices such as using the stairs instead of elevators on campus.

2. Method and analytic plan

2.1. Participants

The total sample size was 202. Participants included undergraduate and graduate students who were at least 18 years old. Students who were in the hallways or the outside area of both buildings were approached to complete a questionnaire regarding stair use.

2.2. Procedure-Development of the poster:

The poster was conceptualized by the first author, and it contained the slogan- "Tuffy leads the Titans on a green path." "Tuffy" is an image of the university mascot- a cartoon elephant. In the poster, Tuffy is walking down a flight of stairs, and the health-related tag line- "Climb a flight of stairs, burn 5 calories and save 2.5 Watts of energy", were installed on each floor beside the elevators of both selected buildings in February 2010. The poster was conceptualized based upon Bailey [13], as well as input provided by faculty members at the first author's university and the university's strategic communications office. Twenty-five 11" x 17" posters were installed in both buildings on February 12th, 2010 and were present when the surveys were administered. Data collection began ten days after the installment of the posters. Those who agreed to complete the questionnaire signed an informed consent form prior to receiving the questionnaire. The data collector made sure to administer the questionnaires in an area where the posters were not directly visible- either in the hallways or the outside area in front of buildings.

2.3. Measures

Demographic variables included age, gender, current major in school, and year at school (e.g., freshman, sophomore, etc.). A multiple choice question was asked to assess whether participants recalled the energy conservation message that the poster contained. It was the following: "To the best of your knowledge, what does this poster [placed in various locations of the building] say?" There was one correct answer and three incorrect answers to choose from.

Other variables of interest included individual use of elevators and stairs, a checklist of everyday energy conservation activities practiced at home (e.g., switching off lights when they are not in use, showering less than 10 minutes, etc.) and self-reported willingness to engage in more energy conservation activities (measured with a Likert scale). The last two items were adapted from the university's sustainability report by Bourdon et al [14]. Use of the elevators and stairs was assessed as self-reported percentages (with the percentage of stair use plus the percentage of elevator use totaling 100 percent).

2.4. Statistical analysis

Descriptive statistics were calculated for all of the questions mentioned above. Next, bivariate logistic regression models were run to determine whether each demographic variable (gender, age, and year in school) was related to poster recall and each energy conservation practice performed at home. Bivariate linear regression models were run to determine whether demographic variables were related to elevator use percentage and willingness to engage in more energy conservation activities. Last, logistic regression models were run to determine whether elevator use, and energy conservation practices performed at home, and willingness to engage in more energy conservation activities were related to poster recall.

3. Results

Please refer to Table 1 for a complete summary of the descriptive statistics.

Nearly one in five participants (20.8%) recalled the poster correctly as "Tuffy leads the Titans on a green path.", 42.6% had not seen the poster at all (Table 1).

About 70 % (n= 145) of the participants used elevator only 0-50% of the time, while about 27 % (n= 56) used the elevator 51-100% time (Table 1).

3.1. Energy conservation activities

The majority of participants (94.1%) reported that they switched off lights when not in use, 72 (35.6%) showered less than 10 minutes, 171 (84.7%) turned off the TV when not using it, 146 (72.3%) separated recyclable and non-recyclable trash, 62 (30.7%) removed the cell phone charger from the outlet after charging their phones and 156 (77.2%) put their computers in standby or hibernation when not in use (Table 1).

The majority of participants either agreed (48%) or strongly agreed (21.8%) that they would be willing to learn more about energy conservation activities (Table 1).

3.2 Demographic differences on Variables of interest

Those with more years of schooling were more likely to shower less than 10 minutes ($p < 0.05$). Furthermore, older age was positively associated with stair use ($p < .05$). Females were more willing to put the computer on standby when not in use than males ($p = 0.050$) (Table 2).

3.3. Poster recall

Those who used the elevator more frequently (rather than the stairs) were more likely to recall the poster message correctly ($p < 0.0001$). Furthermore those who turned off the television when not being used were less likely to recall the poster message ($p < 0.01$) (Table 3).

4. Discussion and Conclusion

This study attempted to determine whether motivational signage with an energy conservation message has the potential to decrease elevator use and increase stair use. Similar previous studies that have used motivational signage to increase stair use have employed a physical fitness message [2,5,9,10]. Bailey [13] suggested that adding an energy conservation message to such signage may be an effective strategy to further increase stair use. Significant savings may occur if an entire university campus is involved in the effort. We also aimed to determine whether poster recall and energy conservation practices varied according to demographic characteristics.

We found that approximately one in five participants correctly recalled the poster message. Rates of recall for posters and banners containing health-related messages in previous studies have ranged from 7% to 76% [7,15,16]. Although rate of recall in this study was not strikingly different than previous research, it is evident that a higher rate of recall would have been more desirable. It is not clear whether the low rate of poster recall in our study is attributed to the content of the message (e.g., the salience of an energy conservation message versus a physical fitness message) or the poster not being as eye-catching to a wider group as a banner [15].

The fact that those who took the elevator frequently (relative to the stairs) more frequently recalled the poster message is encouraging, because the posters were posted in areas that were in view for those taking the elevators. Furthermore, we intended to especially target the students, as they were not taking the stairs as they viewed the poster. We also found that poster recall was significantly lower among those who did report turning off the TV when not in use. Other energy conservation practices (e.g., switching off lights and unplugging the cell phone charger when not in use) also had near significant relationships to lower poster recall. No previous studies could be found in relation to these findings. These findings further suggest that the poster designed for this study was salient to those who could improve their energy conservation practices.

Significant findings regarding the association between demographic characteristics and energy conservation practices were the following: (i) older age was associated with increased stair use, and (ii) more years of schooling was associated with showering less than 10 minutes, the latter finding is consistent with a previous study that examined the duration of showering in the U.S. [17], indicating that perhaps those who are less educated and

younger might be good people to target for energy conservation practices (since they do it at lower rates). The fact that poster recall did not vary by demographic characteristics suggests that the message and the graphics of the poster were equally salient across demographic categories.

Table 1. Demographic Characteristics of the Sample and Variables of Interest

	<u>M</u>	<u>SD</u>
Age	22.4	6.5
	<u>f</u>	<u>%</u>
Gender		
Male	72	35.6
Female	130	64.4
Year in College		
Freshman	34	16.8
Sophomore	39	19.3
Junior	72	35.6
Senior	50	24.8
Graduate	7	3.5
Major		
Arts	3	1.5
Business and Economics	28	13.9
Communication	21	10.4
Education	0	0.0
Health and Human Development	39	19.3
Humanities and Social Sciences	86	42.6
Natural Sciences and Mathematics	9	4.5
Engineering and Computer Sciences	4	2.0
Undecided/ Undeclared	11	5.4
Poster recall		
Recalled the poster correctly	42	20.8
Did not see the poster at all	86	42.6
Remember seeing the poster but could not recall message	49	24.3
Remember seeing the poster but incorrectly recalled message	23	11.4
Percentage of times using the elevator		
0-50%	145	71.8
51-100%	56	27.7
Energy Conservation activities		
Switch off lights	190	94.1
Shower less than 10 minutes	72	35.6
Switch off the TV when not watching	171	84.7
Trash cans for plastic	146	72.3
Remove charger from the socket after use	62	30.7
Computer to standby when not using	156	77.2
Willingness to engage in more environmental conservation activities		
Strongly disagree	3	1.5
Disagree	9	4.5
Neither disagree/ agree	49	24.3
Agree	97	48.0
Strongly agree	44	21.8

Table 2. Associations between Demographic characteristics and Variables of Interest

Variables of interest	Demographic characteristics		
	Gender (Females vs. males)	Age	Year in college
	<u>OR</u>	<u>OR</u>	<u>OR</u>
Poster recall	1.50	0.97	1.19
Switching off the lights when not in use	1.88	1.00	0.89
Showering less than 10 minutes	0.80	1.03	1.40**
Turning off the TV when not in use	0.58	1.08	1.30
Separating recyclable trash	1.70	1.02	1.00
Unplugging cell phone charger after use	1.54	1.00	1.02
Computer on standby when not in use	1.94*	0.98	0.94
	<u>Beta</u>	<u>Beta</u>	<u>Beta</u>
Percentage elevator use	0.04	0.16**	0.12
Willingness to learn more about environmentally friendly activities	0.12	-0.04	-0.03

*p= .050, **p< .05.

Table 3. Energy Conservation Predictors of Correct Poster Recall

	OR
Switching off the lights when not in use	0.34
Showering less than ten minutes	0.77
Turning off the TV when not in use	0.28**
Separating recyclable trash	0.71
Unplugging cell phone charger after use	0.46
Computer on standby when not in use	0.93
Percentage elevator use	1.26***
Willingness to learn more about environmentally friendly activities	0.76

p<0.01; *p< 0.0001.

5. Limitations

This study has some limitations that need to be mentioned. First, given limited resources, only cross-sectional data was collected for this study. Hence, we could not determine whether stair use significantly increased among students after installation of the poster. Second, our findings may not generalize well to other populations that do not use the stairs as frequently. In our study, approximately one in three students reported hardly ever taking the elevator (0-10% of the time), which means that these participants nearly always take stairs. Stair use versus elevator use in other studies has been as low as approximately 5%[2,3,7]. Third, self-reported bias may lead participants to either under-report or over-report their stair use and energy conservation practices, either due to inaccurate recall or social desirability.

This study was one of the first to examine the possibility of using an energy conservation message to increase stair use. To further advance research in this area, a future longitudinal study is needed in which two posters are tested – one with an energy conservation message and one with a physical fitness message. Qualitative data may also be useful to determine participants’ thoughts about the content of the messages, so that further improvements can be made to the poster.

6. Acknowledgments

We would like to thank Dr. John Bock, Mr. Jeffrey Bechtold, Mr. Willem van der Pol, Mr. Greg Keil, Mr. Kurt Borsting, Mr. Howard Chang and Mr. Greg for their inputs in designing and installation of the study poster at the aforementioned University buildings.

7. References

1. M.A.Ford, D.Torok. Motivational signage increases physical activity on a college campus. *Journal of American College Health*.2008; 57(2), 242-244.
2. R.E.Andersen, S.C.Franckowiak, J.Snyder, S.J.Bartlett, K.R.Fontaine. Can inexpensive signs encourage the use of stairs? Results from a community intervention. *Annals of Internal Medicine*.1998; 129(5), 363-369.
3. E.B.Kahn, L.T.Ramsey, R.C.Brownson, G.W.Heath, E.H.Howze, K.E.Powell, E.J.Stone, M.W.Rajab, P.Corso, The Task Force on Community Preventive Services. The effectiveness of interventions to increase physical activity. *American Journal of Preventive Medicine*.2002; 22(4S), 73-107.
4. F.F.Eves, O.J.Webb, N. Mutrie. A workplace intervention to promote stair climbing: Greater effects in the overweight. *Obesity (Silver Spring)*, 2006; 14(12), 2210-2216.
5. O.J. Webb, F.F. Eves. Promoting stair use: single versus multiple stair-riser messages. *American Journal of Public Health*.2005; 95(9), 1543-1544.
6. O.J.Webb, F.F.Eves. Promoting stair climbing: effects of message specificity and validation. *Health Education Research*.2007;22(1), 49-57.
7. O.J.Webb, F.F.Eves. Effects of environmental changes in a stair climbing Intervention: Generalization to stair descent. *American Journal of Health Promotion*. 2007; 22(1), 38-44.
8. J.Kerr, F.Eves, D.Carroll. Can Posters prompt stair use in a worksite environment?.*Journal of Occupational Health*. 2001;43, 205-207.
9. K.N.Boutelle, R.W.Jeffery, D.M.Murray, M.K.H.Schmitz. Using signs, artwork, and music to promote stair use in a public building. *American Journal of Public Health*. 2001; 91(12), 2004-2006.
10. The Centers for Disease Control and Prevention. *StairWELLTo Better Health*. WELCOA's *Absolute Advantage Magazine*.2006; 5(10), 2-13.
11. A.Blamey, N.Mutrie, T.Aitchison. Health promotion by encouraged use of stairs. *British Medical Journal*. 1995;311, 289-290.
12. H. M. Sachs. Opportunities for elevator energy efficiency improvements. *American Council for anEnergy-Efficient Economy (ACEEE)*. <https://aceee.org/files/pdf/white-paper/elevators2005.pdf>. Date published:1/4/2005.
13. K. Bailey. Going up to go green. *The IUSB Preface*. Retrieved August 19, 2011, from <http://www.iusbpreface.com/2.3825/going-up-to-go-green-1.794882?pagereq=2>. Date published: 21/10/2009.
14. S.Bourdon, A.Hamedani, G.Keil, S.McMahan, G.Pakalns-Naruo, F.Teves, S.Tschabrun, S.Yassine. Sustainability Report. Retrieved from <http://vpadmin.fullerton.edu/AssociateVP/OrgDev/UnivLeadAcademy/LeadDevProg/ProjectReports/SustainabilityCombinedReport.pdf>. Date accessed: 1/5/2009.
15. J.Kerr, F.Eves, D.Carroll. Encouraging Stair use: Stair- riser banners are better than posters. *American Journal of Public Health*. 2001; 91(8), 1192-1193.
16. H Blake, S Lee,T Stanton, T.Gorely. Workplace intervention to promote stair-use in an NHS setting. *International Journal of Workplace Health Management*. 2008; 1(3), 162-175.
17. C.R.Wilkes, A.D.Mason, S.C.Hern. Probability distributions for showering and bathing water-use behavior for various U.S. Subpopulations. *Risk Analysis*.2005; 25(2), 317–337.

The Publication fee is defrayed by Indian Society for Education and Environment (iSee). www.iseeadyar.org

Citation:

Somya Mullapudi, Michele Mouttapa, Shari McMahan.Factors linked to energy conservation practices, recall of energy conservation messages, and stair use among university students. *Indian Journal of Energy*. 2014; 3 (1), 148-153