7-27-2021

# Stair Versus Elevator Use in a University Residence Hall Setting

Vincent Berardi
*Chapman University*, berardi@chapman.edu

Benjamin D. Rosenberg
*Dominican University*

Sophie Srivastava
*Chapman University*, srivastava@chapman.edu

Noah Estrada-Rand
*Chapman University*

Julia Frederick
*Chapman University*



## Recommended Citation

Berardi, V., Rosenberg, B. D., Srivastava, S., Estrada-Rand, N., & Frederick, J. (2021). Stair versus elevator use in a university residence hall setting. *Journal of American College Health*. https://doi.org/10.1080/07448481.2021.1920602

# Stair versus Elevator Use in a University Residence Hall Setting

Vincent Berardi[a]*, Benjamin D. Rosenberg[b], Sophie Srivastava[a], Noah Estrada-Rand[a], and Julia Frederick[a]

[a]*Department of Psychology, Chapman University, Orange, CA, USA*

[b]*Department of Psychology, Dominican University, San Rafael, CA, USA*

*berardi@chapman.edu

# Stair versus Elevator Use in a University Residence Hall Setting

Objective: Determine the temporal and spatial characteristics of stairs versus elevator use in a university residence hall to inform future physical activity promotion efforts.

Participants: All residents and visitors for a single, four-story residence hall located on a college campus in Orange, CA.

Methods: Smart mat systems capable of detecting pedestrian traffic were placed in front of the stairs and elevators on each floor plus a basement. Generalized additive mixed models (GAMMs) were used to compare stair versus elevator usage at different times of the day and on different floors.

Results: Stair versus elevator use varied much more throughout the day on floors nearest to the ground floor, with stair use most common in the morning. Overall, the elevator was used more frequently on higher floors, with less variation throughout the day.

Conclusion: To be most effective, future stair promotion interventions should target residents on higher floors and in the morning.

Keywords: physical activity; stairs; elevator; adaptive interventions

**Introduction**

Regular moderate-to-vigorous exercise is known to improve physical and mental health, [1–6] yet a majority of Americans do not achieve the federal guidelines of 150 weekly minutes of moderate-intensity physical activity.[7,8] Improving upon this outcome will be most effective if efforts focus on multiple fronts, including individual, clinical and community approaches. Regarding the latter, the World Health Organization has recognized workplaces and schools as suitable environments for the implementation of physical activity and obesity prevention programs,[11] while others have highlighted the role that community interventions could play in increasing physical activity.[12]

University environments could benefit from exercise promotion efforts. A study of 233 students found a decrease in physical activity from high school to college, with only 20% and 38% of college students participating in moderate or vigorous physical activity, respectively.[13] Additionally, the 2019 American College Health Association's National College Health Assessment showed that only 45.7% of college students engaged in sufficient moderate/vigorous physical activity over the previous week. Taken together, these studies show that there is ample opportunity to improve both short- and long-term public health by encouraging more exercise among college students. In line with this reasoning, the current study aims to lay the groundwork for encouraging stair versus elevator use in college residence halls.

On average, 49% of undergraduates reside in on-campus housing,[14] which means these environments are a logical focus for campus physical activity promotion. A low-risk, potentially high-reward way in which this could be operationalized is by encouraging stair versus elevator use in university housing complexes. As described in the CDC's Community Preventive Services Task Force[15], stair use is a healthy behavior that is easy to incorporate into daily routines, [16,17] including those that occur within a university setting.[18] Stair use is often encouraged through point-of-choice (POC) prompts placed at the juncture between stairwells and elevators. This approach has been successfully deployed in university housing settings [19,20] and in the general public.[21–25] POC prompts are an example of nudges, which are choice architectures that leverage specialized environmental designs to subtly encourage people to make beneficial decisions, without compromising their freedom of choice.[26]

To be most effective, nudges should be tailored to the specific characteristics of the population they are attempting to affect.[27,28] For encouraging stair use, this process might include explicitly targeting certain times of day and/or building locations that are particularly prone to elevator use. However, temporal and floor-based variations in stair versus elevator use are not well understood, which limits researchers' ability to customize interventions. This is especially true in university residence settings, which often have multi-story layouts[22,23], activity levels that likely vary over the course of a day and throughout the week, and an increased potential for equipment to be vandalized. These attributes can make it exceptionally difficult to characterize stair/elevator use via standard assessment methodologies.

The methods typically used to assess stair versus elevator use fall into the three classes: direct observation, video recording, and automatic sensors. In direct observation, trained coders embed themselves in an environment and manually record activity.[22,23] Because it is labor intensive, this approach is typically restricted to observing behavior over relatively short time intervals. This lack of longitudinal data is likely a minor limitation in environments that only experience high foot traffic during specific times of day, such as an office building. But in a university housing setting, where activity is expected during a wide range of times, direct observation is not apt to capture the full dynamics of stair versus elevator use. Direct observations can be extended by using cameras to record video of stairwells and elevators, which is then processed by trained coders to quantify use.[21] While this approach enables behavior to be observed over extended periods of time and increases the precision of assessments,[29] privacy concerns limit its applicability in a residential setting. Lastly, automatic counters, such as infrared sensors[30,31] and magnetic switches[32] have also been used to assess stair/elevator activity. While these devices avoid the shortcomings of direct observation and video recording, they are expensive and are required to be mounted to walls/railings, which are often not available or leaves them prone to vandalism. Such characteristics make them impractical when attempting to fully characterize stair versus elevator usage in university dormitories with multiple floors, stairwells, and elevators.

Because existing measurement approaches are unable to quantify stair versus elevator use with the level of detail required to tailor interventions to the unique characteristics of a typical university residence hall, we developed an alternate approach that uses smart floor mats. These devices are relatively low-cost, unobtrusive enough to be installed for several weeks, do not require equipment to be mounted, and avoid the privacy concerns associated with video cameras. This paper describes a two-week deployment of the smart mat system in a university residential building, which was designed to address our research question concerning the spatio-temporal profile of stair versus elevator use. We also discuss how these results will be incorporated into the design and development of novel, customized interventions.

## Materials and Methods

### *Description of Smart Floor Mat System*

The smart floor mat system consisted of a United Security 900 Series piezoelectric mat connected to a Lascar USB-5 event data logger. When stepped on, the 2ft.-by-3ft. mat produced an electrical charge that was transmitted to the data logger to record and timestamp the event. Before being deployed in our main study, this system was piloted in both a controlled laboratory setting and in a university parking structure. In the laboratory, one researcher walked on the mat while a second recorded the time of each event via a smartphone timestamping application. In the parking structure, smart mat systems were placed in front of a stairwell and elevator while researchers covertly observed people encountering the mat and recorded such events on a smartphone. In both cases, the smart mat data was cross-referenced with the directly observed, ground-truth mat interaction data. The experiments indicated that when a single person encountered the mat, often multiple events in close temporal proximity to each other, rather than a single event, were recorded. We rectified this issue via a post-measurement processing step that merged all recorded events within 0.3 seconds of each other into one event. This adjustment resulted in the smart mat system accurately detecting pedestrian traffic, except in the rare case of multiple people simultaneously pressing the mat, which led to only one event being recorded. The parking structure field study also showed that most people stepped on the mat without hesitation when taking the stairs or elevator.

***Stair Use Assessment in University Residence Hall***

This study was conducted in a four-story university residence hall that houses 440 students and is set among other dormitories and residential housing complexes. Resident housing is present on all floors and there are two administrative offices on the first floor; there is also a basement that contains a laundry room and fitness center. A stairwell is located in the center of each floor, with one elevator present on each side. The stairwell has an open layout and is immediately visible upon entering using the first-floor entrance.

On every floor, one mat/datalogger system was installed in front of the stairwell and each elevator for 17 days. Project personnel performed daily inspections to ensure that the mats remained properly positioned. To avoid response bias, installation and inspection were scheduled for times when interaction with residence hall residents was expected to be minimal. Approximately halfway through the study, heavy-duty duct tape was used to secure mats to rectify instances of mats slightly shifting from their intended location.

This study was approved by the Chapman University Institutional Review Board (#IRB-18-111**).**

***Statistical Analysis***

Data from the first and last day of the study were eliminated, so that only whole days remained. For each mat, time was broken into one-hour windows and the number of events (i.e., mat presses) recorded within each window was aggregated. Based on the mat validity assessments, all events that occurred within 0.3 seconds of each other were merged into one event, associated with the earliest time. For each time window, the events for the two elevators on each floor were aggregated, yielding one stair and one elevator measure per floor.

The data were analyzed via generalized additive mixed models (GAMMs) with a Poisson link function that modeled the total number of stair plus elevator trips as the dependent variable. Study date was specified as a random intercept effect that allowed the mean number of trips to vary by day. Time was modeled with eight-knot, cyclical cubic spline smoothing functions, a non-parametric approach that allows for a non-constrained exploration of temporal fluctuations in the number of trips. The floor on which a mat was located was included as both a main variable and an interaction term with time. Weekday versus weekend status was also included as a covariate. Due to malfunctioning equipment, the first floor was eliminated from all analyses.

This analysis was repeated (using a binomial link) with the probability of taking the elevator within each time window as the dependent variable. The total number of stair plus elevator trips within a given time window as included as a covariate. In a supplementary analysis, the number of fourth floor stair trips was also added as a covariate, in order to assess whether encountering intermediate stair mats on trips to the fourth floor affected results.

All statistical analyses were performed within the R statistical software package.

**Results**

Table 1 illustrates the results of the GAMM modeling for the total number of stair plus elevator trips. Each floor had more total trips compared to the basement, with the largest difference being the second floor, which had 78% more total trips. The third floor had the smallest deviation from the basement. Weekends had 21% fewer trips than weekdays. Figure 1 illustrates estimates of the time trajectories of the total trips for each floor, with main effects removed. The pattern was consistent over all floors. The smallest number of trips was reported at approximately 4AM. At this point, the number of trips increased steadily until approximately 11AM, when the rate of increase slowed and the number of trips were relatively steady. Beginning at approximately 9PM, the number of total trips decreased until reaching the minimum at 4AM. The basement had an additional dip at around 7:30PM.

| | ***b*** | **95 % CI** | ***β*** |
|---|---|---|---|
| Floor | | | |
| *Basement (ref.)* | - | - | - |
| *Floor 2* | 0.58 | (0.55, 0.60) | 1.78 |
| *Floor 3* | 0.17 | (0.14, 0.20) | 1.18 |
| *Floor 4* | 0.30 | (0.27, 0.32) | 1.34 |

| | | | |
|---|---|---|---|
| Day of Week (Weekend) | -0.23 | (-0.35, -0.11) | 0.79 |

Table 1. Results of GAMM modeling to predict total number of stairs + elevator trips. ***b*****:** regression coefficient, **95% CI:** 95% confidence interval for $b$, $\boldsymbol{\beta}$**:** Poisson estimate given by exp($b$), also known as incidence risk ratio. $p$-values for all regression coefficients were less than 0.001.

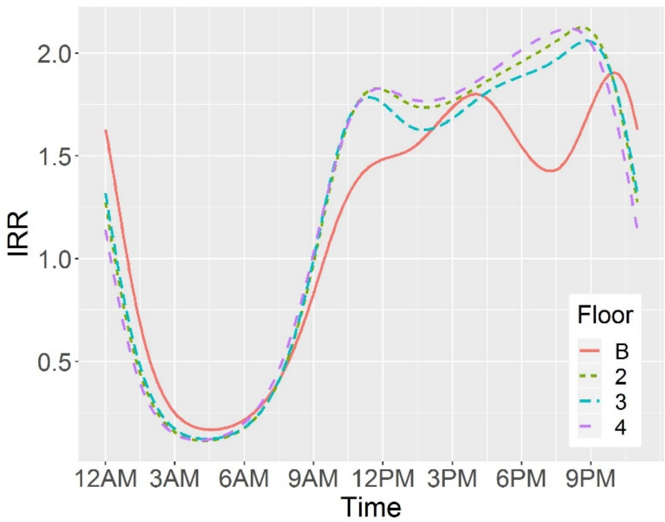


Figure 1. Estimated time trajectories of total steps, after accounting for main effects. For each trajectory, p<.0.001, indicating the presence of a significant temporal trend.

The results of the GAMM modeling for the probability of using the elevator are shown in Table 2. Relative to the basement, residents were 74% less likely to use the elevator when traveling to/through the second floor and 44% less likely for the third floor. This pattern was reversed for the fourth floor, where, relative to the basement, residents were 2.21 times more likely to have used the elevator. The probability of stair versus elevator use did not significantly change according to weekday versus weekend days, but a larger total number of trips within an hour was associated with increased elevator use.

| | **OR** | **95 % CI** |
|---|---|---|

| | | |
|---|---|---|
| Floor | | |
| *Basement (ref.)* | - | - |
| *Floor 2* | 0.26 | (0.25, 0.28) |
| *Floor 3* | 0.56 | (0.53, 0.60) |
| *Floor 4* | 2.21 | (2.08, 2.34) |
| Day of Week (Weekend) | 1.12 | (0.84, 1.48) |
| Total Trips | 1.05 | (1.02, 1.07) |

Table 2. Results of GAMM modeling to predict probability of taking the elevator. **OR:** odds ratio, **95% CI:** 95% confidence interval for OR. With the exception of Day of Week, $p$-values were less than 0.001 for all regression coefficients.

Figure 2 illustrates temporal trends in the probability of taking the elevator for each floor, with main effects removed. Compared to floors 2 and 3, the patterns were qualitatively different for the basement and floor 4, which may be associated with the higher overall elevator use on these floors. There were large variations for the second and third floor, with peak elevator use occurring in the early morning (~2AM -3AM), when the probability of taking the elevator was nearly twice that of using the stairs (after accounting for main effects), followed by a sharp decrease to a minimum at approximately 6AM-7AM, when stair use was nearly 40% more likely. A smaller peak occurred at approximately 1PM followed by a smaller minimum at approximately 7PM. The basement and fourth floor did not have as much variation, with values oscillating between 20% more/less likely to take the elevator and peaks/troughs occurring at approximately 4AM/4PM and 10AM/8PM, respectively. Results were nearly identical when including the number of fourth floor stair trips as a covariate.

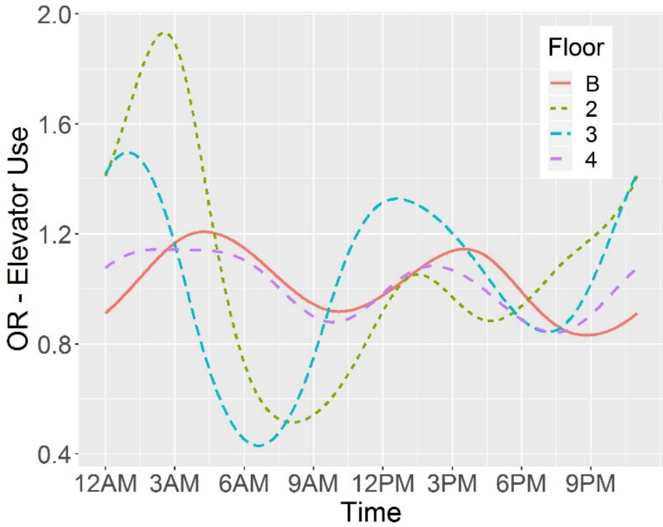


Figure 2. Estimated time trajectories of odds ratios for the probability of taking the elevator, after accounting for main effects. For each trajectory, p<.0.001, indicating the presence of a significant temporal trend.

**Discussion**

The smart mat systems used in this study allowed the spatio-temporal characteristics of stair and elevator use in a college residence hall to be described with a particularly high level of precision. The total number of combined trips was largest for the second floor, which may be due to the second-floor stair mat being encountered as individuals climbed to higher floors. Total trips decreased for the third and fourth floors, but smallest number recorded was for the basement, which can be assumed to be due to the absence of residential rooms on this floor. Time trajectories for total trips were consistent over all floors, with relatively consistent values from 10AM to 10PM, then a decrease to a minimum at approximately 4AM.

Relative to the basement, people traveling to the second and third floors were more likely to take the stairs, but trips to the fourth floor were more likely to be in the elevator. The higher proportion of stair trips recorded on the second and third floor may have been partially due to individuals taking the stairs to the fourth floor and encountering intermediate mats, which does not occur for elevator trips. This possibility was explicitly evaluated by including the number of fourth floor stair trips as a covariate in the analysis. The relationship between stair and elevator probability and floor was minimally affected by this covariate. Elevator use was least probable in the morning and early evening and most probable in the afternoon and late night. A greater volume of total trips was also associated with a higher probability of elevator use.

The findings outlined within this study have several implications for the design and customization of stair promotion interventions aimed at increasing college students' physical activity. Intervention efforts should be specifically directed towards residents living in higher floors. One intriguing option is to nudge individuals to exit the elevator one or two floors early when headed to high floors and use the stairs to complete their trip. This approach could be particularly useful in buildings with many stories, where full stair trips are likely to be impractical. Additionally, residence halls should focus on the afternoon and late evening, when elevator usage was more frequent. This could take the form of messaging (e.g., "Avoid the afternoon energy crash, take the stairs to wake up your body") and/or time-based intervention features (prize codes placed in the stairwell during afternoons). To allow for additional customization of forthcoming interventions, future work should use the approaches outlined in this paper to discriminate differential stair versus elevator use in several domains. These could include time of year, different majors, on-campus versus off campus housing, residence halls versus other building types, and class standing (e.g., underclass vs. upperclass housing).

In this study, the benefits of the smart mat system were limited to its ability to collect continual measurements of students' stair and elevator use over extended periods of time while maintaining their privacy. But this technology can potentially be used to significantly refine interventions towards dynamic, interactive systems. The smart mats can easily be connected to an Arduino, Rasberry Pi or similar device to create dynamic, and potentially interactive displays, that adapt in response to time of day, the presence of someone on the mat, the average level of foot traffic, the day's history of stair/elevator use, and/or a suite of other variables. More sensitive mats can also be used to discriminate the direction in which pedestrians are walking, their weight, and/or the number of people traversing the mat at any given time. While such devices are cost-intensive, they would offer an unprecedented characterization of stair versus elevator use that could likely be used to dramatically improve intervention efforts.

This study is part of an overall effort to encourage college students to increase their physical activity levels. While replacing a single residence hall elevator trip with a stair trip does not constitute a large amount of activity, existing active living/built-environment research has established that once a behavior is established within a specific environment, it can be generalized to other contexts.[33] This approach has the potential to be particularly salient in a university setting since a.) students typically enter several buildings each day, many of which are large, with opportunities for stair use, b.) students also commute frequently and may have a multitude of transportation options to choose from (e.g. walking versus shuttle), and c.) enrolling in a university usually represents a large change in life circumstances, which has been recognized as an opportune time for establishing new habits.[34] Given that the characteristics of a university environment are amenable with increasing physical activity, the promotion of stair versus elevator use in a university setting may be a low-cost, low-risk strategy for improving societal health.

This study had many strengths, including the use of low-cost smart mat systems that were not required to be mounted to record stair/elevator use 24-hours a day over extended periods of time, without compromising privacy. However, there were several limitations to our approach. The mats were not able to distinguish between one person or several people simultaneously standing on them. Additionally, someone traveling to the fourth floor by stairs likely encountered a stair mat on every floor on the way, but someone taking the elevator during this time did not; this could bias results. While the mats were inspected every day, there were several instances where they had shifted from the location where they were installed, a situation that was eventually rectified by using duct tape to secure the mats. Lastly, a faulty data logger compromised the stair data collected from the first floor, which resulted in this floor being eliminated from all analyses.

In conclusion, we have detailed the use of novel smart mat systems to outline the spatio-temporal characteristics of stair versus elevator use in a university residence hall. Results indicated that elevator use was more likely to occur on higher floors and during the afternoon and late evening. These results can be used to customize interventions that encourage stair versus elevator usage, in attempt to instill healthy habits in students that will be hopefully be sustained long after they have left the college environment.

**References**


1. U.S. Department of Health and Human Services. Physical Activity Guidelines for Americans, 2nd edition. 2018.
2. Gondim OS, Nunes De Camargo VT, Gutierrez FA, et al. Benefits of Regular Exercise on Inflammatory and Cardiovascular Risk Markers in Normal Weight, Overweight and Obese Adults. *PLoS One*. 2015. doi:10.1371/journal.pone.0140596
3. Warden SJ, Fuchs RK. Physical Activity to Promote Bone Health in Adolescents. In: *A Practical Approach to Adolescent Bone Health*. Springer International Publishing; 2018:53-76. doi:10.1007/978-3-319-72880-3_4
4. McTiernan A, Friedenreich C, Katzmarzyk PT, et al. Physical Activity in Cancer

Prevention and Survival. *Med Sci Sport Exerc*. 2019;51(6):1252-1261. doi:10.1249/MSS.0000000000001937

5. Hallgren M, Nguyen T-T-D, Owen N, et al. Cross-sectional and prospective relationships of passive and mentally active sedentary behaviours and physical activity with depression. *Br J Psychiatry*. March 2019:1-7. doi:10.1192/bjp.2019.60
6. Brasure M, Desai P, Davila H, et al. Physical activity interventions in preventing cognitive decline and alzheimer-type dementia a systematic review. *Ann Intern Med*. 2018;168(1):30-38. doi:10.7326/M17-1528
7. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical Activity in the United States Measured by Accelerometer. *Med Sci Sport Exerc*. 2008;40(1):181-188. doi:10.1249/mss.0b013e31815a51b3
8. Physical Activity Guidelines Advisory Committee. Physical Activity Guidelines Advisory Committee Report. *Washingt DC US*. 2008. doi:10.1111/j.1753-4887.2008.00136.x
9. Sogari G, Velez-Argumedo C, Gómez MI, Mora C. College students and eating habits: A study using an ecological model for healthy behavior. *Nutrients*. 2018. doi:10.3390/nu10121823
10. World Health Organization. *Young People: Health Risks and Solutions. 2014 Fact Sheet.*; 2014.
11. World Health Organization. *The Challenge of Obesity in the WHO European Region and the Strategies for Response*.; 2007.
12. 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(4 SUPPL. 1):73-107. doi:10.1016/S0749-3797(02)00434-8

13. Calestine J, Bopp M, Bopp CM, Papalia Z. College Student Work Habits are Related to Physical Activity and Fitness. *Int J Exerc Sci*. 2017;10(7):1009-1017.

14. U.S. Department of Education - National Center for Education Statistics. *2015–16 National Postsecondary Student Aid Study (NPSAS:16)*.; 2018.

15. Community Preventive Services Task Force T. Environmental and Policy Approaches to Increase Physical Activity: Point-of-Decision Prompts to Encourage Use of Stairs Task Force Finding Intervention Definition Task Force Finding (June 2005)*. 2014;38:290-291.

16. Meyer P, Kayser B, Kossovsky MP, et al. Stairs instead of elevators at workplace: Cardioprotective effects of a pragmatic intervention. *Eur J Prev Cardiol*. 2010;17(5):569-575. doi:10.1097/HJR.0b013e328338a4dd

17. Teh KC, Aziz AR. Heart rate, oxygen uptake, and energy cost of ascending and descending the stairs. *Med Sci Sports Exerc*. 2002. doi:10.1249/00005768-200204000-00021

18. Hodgin KL, Graham DJ. Mirror, mirror by the stairs: The impact of mirror exposure on stair versus elevator use in college students. *Front Public Heal*. 2016;4(April):1-9. doi:10.3389/fpubh.2016.00080

19. Ford MA, Torok D. Motivational signage increases physical activity on a college campus. *J Am Coll Heal*. 2008;57(2):242-244. doi:10.3200/JACH.57.2.242-244

20. Howie EK, Young DR. Step it up: A multicomponent intervention to increase stair use in a university residence building. *Am J Heal Promot*. 2011;26(1):2-5. doi:10.4278/ajhp.091106-ARB-357

21. van Nieuw-Amerongen ME, Kremers SPJ, de Vries NK, Kok G. The use of prompts, increased accessibility, visibility, and aesthetics of the stairwell to promote stair use in a university building. *Environ Behav*. 2011;43(1):131-139.

doi:10.1177/0013916509341242

22. Grimstvedt ME, Kerr J, Oswalt SB, Fogt DL, Vargas-Tonsing TM, Yin Z. Using signage to promote stair use on a university campus in hidden and visible stairwells. *J Phys Act Heal*. 2010;7(2):232-238. doi:10.1123/jpah.7.2.232

23. Crozier AJ. Step up: Exploring the impact of social prompts on stair use in a university setting. *Psychol Sport Exerc*. 2019;41(October 2018):99-106. doi:10.1016/j.psychsport.2018.11.015

24. Eckhardt MR, Kerr J, Taylor WC. Point-of-decision signs and stair use in a university worksite setting: General versus specific messages. *Am J Heal Promot*. 2015;29(5):291-293. doi:10.4278/ajhp.120816-ARB-398

25. Coelho C V, Smith LS, Mertens RM, et al. *Creating Healthy Work Environments 2019 Stairwell: Increasing Activity Among Nursing Students and Faculty Title: Stairwell: Increasing Activity Among Nursing Students and Faculty*.; 2019.

26. Thaler RH, Sunstein CR. *Nudge: Improving Decisions about Health, Wealth, and Happiness*.; 2008. doi:10.1016/s1477-3880(15)30073-6

27. Peer E, Egelman S, Harbach M, Malkin N, Mathur A, Frik A. Nudge me right: Personalizing online security nudges to people's decision-making styles. *Comput Human Behav*. 2020;109(February):106347. doi:10.1016/j.chb.2020.106347

28. Goldstein DG, Johnson EJ, Herrmann A, Heitmann M. Nudge your customers toward better choices. *Harv Bus Rev*. 2008;86(12):99-105.

29. Bellettiere J, Nguyen B, Liles S, et al. Prompts to increase physical activity at points-of-choice between stairs and escalators: What about escalator climbers? *Transl Behav Med*. 2018;9(4):656-662. doi:10.1093/tbm/iby080

30. Swenson T, Siegel M. Increasing stair use in an office worksite through an interactive environmental intervention. *Am J Heal Promot*. 2013.

doi:10.4278/ajhp.120221-QUAN-104

31. Blake H, Lee S, Stanton T, Gorely T. Workplace intervention to promote stair-use in an NHS setting. *Int J Work Heal Manag*. 2008;1(3):162-175. doi:10.1108/17538350810926525

32. Titze S, Martin BW, Seiler R, Marti B. A worksite intervention module encouraging the use of stairs: Results and evaluation issues. *Soz Praventivmed*. 2001;46(1):13-19. doi:10.1007/BF01318794

33. Sallis JF, Cervero RB, Ascher W, Henderson KA, Kraft MK, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health*. 2006;27(1):297-322. doi:10.1146/annurev.publhealth.27.021405.102100

34. Neal DT, Wood W, Quinn JM. Habits - A repeat performance. *Curr Dir Psychol Sci*. 2006;15(4):198-202. doi:10.1111/j.1467-8721.2006.00435.x