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# Effects Of An Intervention To Promote Stair Use In A University Building

Bethany Anne Marie Brandvold

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EFFECTS OF AN INTERVENTION TO PROMOTE STAIR USE IN A UNIVERSITY  
BUILDING

by

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Bachelor of Science, University of North Dakota, 2010

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Science

Department of Kinesiology

Grand Forks, North Dakota

December

2012

This thesis, submitted by Bethany Brandvold in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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Dr. Wayne Swisher  
Dean of the Graduate School

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Date

Title            Effects of an Intervention to Promote Stair Use in a University Building  
Department    Kinesiology  
Degree         Master of Science

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Bethany Brandvold  
December 2012

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## ABSTRACT

Wellness programs have been implemented by companies and other organizations for various reasons since before the 1970s, and many have focused on the promotion of physical activity as a health-promoting behavior. Promoting physical activity via stairwell prompting at the workplace has become very popular in recent years. This study tested an intervention based upon motivational signage placed in the stairwells of a University administrative building, as well as daily emails sent to the employees in the building. Key concepts from Self-Determination Theory (SDT) and a sub-theory of SDT, Organismic Integration Theory (OIT) were integrated into the messages of the posters and emails encouraging stair use among employees of the building. Twelve motivational signs were placed in stairwells and in front of elevator openings, and five motivational emails were sent out during the five-day intervention period. Automatic “people counters” were used to track use of the elevators and stairs. After the intervention, building employees were invited to complete a questionnaire designed to assess whether their SDT-related perceptions were influenced by the motivational e-mails and posters.

Chi square analyses of the counter data showed that the motivational messages increased stair use by individuals using the building. The staircase mainly used by building employees showed the largest increase in use during the intervention. The questionnaire responses indicated that three out of the four SDT-related motivational perceptions were enhanced by the e-mail messages and stairwell posters.

## CHAPTER I

### INTRODUCTION

This study investigated the effect of motivational prompts in the form of emails and posters in encouraging stair use among visitors and employees in a building. The study used electronic “people counters” to keep track of stairwell and elevator use in the building.

Five-percent of the mortality rate in the world is caused by being overweight or obese (Eves & Lewis, 2012). Chronic diseases associated with overweight and obese individuals, such as diabetes, hypertension, cardiovascular disease, and osteoporosis (Muller-Riemenschneider, Nocon, Reinfeld, & Willich, 2010) are only a few issues that could be alleviated with regular physical activity. Physical activity is one of the best ways to prevent weight gain and avoid diseases associated with weight gain, as even small amounts of physical activity can burn calories and lead to weight loss (Pillay, Kolbe-Alexander, Achmat, Carstens, & Lambert, 2009). Yet, two thirds of the population in developed countries are physically inactive (Adams & White, 2002). Although the general population is aware that physical activity can be the cure to many diseases and disorders, meeting the recommended amount of physical activity during their day can be overwhelming; therefore, many healthcare leaders are changing their recommendations to encourage “active living,” which is adding activity into daily routines (Titze, Martin, Seiler, & Marti, 2001).

Many job duties an individual may be required to accomplish during his or her workday consist of sedentary work activities, such as sitting at a desk for prolonged time periods (van Uffelen et. al, 2010). This sedentary behavior may carry health risks, even if the individual is meeting the general physical activity requirements of 30 minutes a day on five or more days a week (USDHHS, 2008). There is a growing body of evidence showing that prolonged sedentary behavior will cause health risks (van Uffelen et al, 2010). Signs showing risks related to sedentary behavior have been noticed since the 1950s, when sudden death rate was a third less apparent in conductors of double-decker buses, who were required to collect fees from both floors of their bus, than their driver counterparts (Heady, Morris, & Kagan,1961). One way to prevent these health risks caused by sedentary behavior would be to incorporate physical activity into the workday. In a meta-analysis of physical activity interventions in the workplace by Conn, Hafdahl, Cooper, Brown, and Lusk (2009) it was stated that workplace physical activity interventions have been in place since 1969. The authors' findings conclude that physical activity interventions can improve employees' health. Employers, however, may not be agreeable to letting their employees participate in lengthy physical activity during work hours. One way to avoid this dilemma could be encouragement of using available physical activity resources in the workplace, such as the stairs.

It has been estimated that stair use utilizes 8.6 times more energy than that of a resting state, consequently making stair use one method that may be used for obtaining health benefits (Pillay, Kolbe-Alexander, Achmat, Carstens, & Lambert, 2009). Stair use at the workplace has been associated with lowered risk of cardiovascular disease, along with other health benefits (Olandar & Eves, 2011). Stair use at work can also be

accomplished in small bouts; even seven minutes of stair use a day can reduce heart disease by two thirds (Eves, Webb, & Mutrie, 2006), possibly making this method of physical activity a more time-friendly worksite wellness program to employers.

Point-of-choice situations where the individual must choose between the stairs or an elevator or escalator is most often found in the workplace (Eves, 2010), making stair use a feasible mode of physical activity at work. A national health campaign to offset the U.S. obesity epidemic stated that their recommendation to “use the stairs over the escalator” was one of the most practical of the recommendations (Dolan, Weiss, Lewis, Pietrobelli, Heo, & Faith, 2006) .

In a study conducted by Kerr, Eves, and Carroll (2000), when participants were asked what their reason was for taking the stairs the more popular response was for “improved health.” One potential issue when promoting physical activity at work may be encouraging employees to use the stairs as a mode of transportation rather than an elevator or escalator. Motivational signs in the stairwell used as prompts for physical activity are both inexpensive and effective (Boen, Maurissen & Opdenacker, 2010).

An issue that arises in the current research on stair use as a wellness program is that interventions intended to motivate behavior change have rarely been based on contemporary motivation theories. A major contemporary theory on motivation, Self-Determination Theory (SDT), focuses on the extent that behaviors are self-determined and explains the three basic psychological needs a person must satisfy in order to experience a feeling of positive development and well-being. These three basic psychological needs are autonomy, relatedness, and competence. Autonomy can be described as being able to render your own choices when it comes to situations.

Competence is the belief that you are capable of successfully mastering a task.

Relatedness is feeling a sense of connection to peers and others around you. A sub-theory of SDT, Organismic Integration Theory (OIT), also provides useful information on encouraging motivation. Figure 1, specifically OIT, outlines the different types of motivation a person can experience, ranging from amotivation (no motivation at all) to intrinsic motivation (where an individual completes a task completely for enjoyment or pleasure, even though no external reward will be received with the completion of the task) (Hagger & Chatzisarantis, 2007).

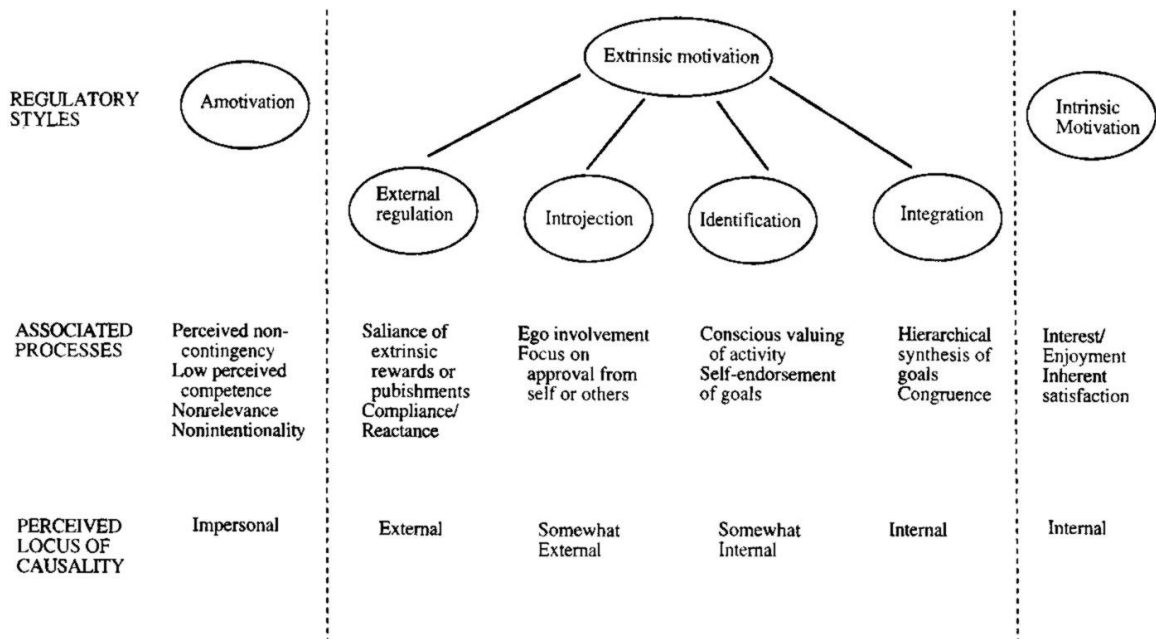


Figure 1. Organismic Integration Theory

Hagger and Chatzisarantis found identified regulation (IR) to be positively associated with exercise. IR is not completely intrinsic (completing a task completely for enjoyment, while expecting no reinforcement or reward), but aids in supplementing personally held values, such as wellness. People, especially adults, who engage in exercise often engage in the exercise because they value their health and want to reap the

health benefits physical activity provides. This information provides the suggestion that SDT and IR will persuade people to participate in exercise by choosing to use the stairs because of the beneficial result caused from the activity; better health. Under IR, Stair climbing can be viewed as a task completed because the individual climbing the stairs values the health benefits of the activity. Although this individual may not enjoy stair climbing as much as another form of physical activity, such as bike riding, he or she completes it because the health benefits seem worth the voluntary effort.

Although posters and signs in the stairwell are a common practice of stair use prompting interventions (see Table 1), extensive literature searches found only one study that utilized both posters and email prompts. After poster prompts were positioned in a worksite stairwell, an email was sent out to further endorse the information on the signs (Auweele, Boen, Schapendonk, & Dornez, 2005). In this study, when one email was sent a week after stair use prompts in the form of posters were displayed in a hospital, stair use increased, yet no studies reviewed looked at the effect of multiple emails accompanying poster prompts to promote elevated stair use. Although many studies discuss using motivational messages related to health on the poster prompts to promote stair use, no studies reviewed tailoring the motivational messages used on posters to theories of motivation, such as SDT.

The aim of this study was to promote stair use, a mode of physical activity, to employees in a Midwestern university building by installing motivational posters tailored toward SDT along with multiple motivational emails.

Table 1. Recent Studies on Stair Prompting in a Building

Authors, Year	Length of Study	Prompt Used, Significant Findings	Future Research
Lewis & Eves, 2012	Eighteen days (4 hours each day)	Motivational Poster. No significant difference when poster was positioned alone inside an elevator. Stair use increased when a point-of-choice prompt was added.	Greater resources to account for components such as total flights climbed, pedestrian traffic, weight status, age, ethnicity, and presence of large bags
Eves, 2012 (currently under review)	Five weeks	Poster with health related message. Small effects were noticed in stair climbing overall.	Further research should focus on longer duration interventions held on differing days for a more complete analysis of effects
Webb & Smith, 2011	Six months	Observations made for six months for urban areas identifying point of choice locations (when choice between stair and elevator or escalator is evident). National and work/ community venues would be a better target for stair climbing interventions.	Quasi-randomized designs with intervention and control sites
Olander & Eves, 2011	Sixteen days	Elevator availability. Stair use increased when less elevators were available.	Researchers should control for building occupancy, time of day, pedestrian traffic
Eves, Olander, Webb, Griffin, Chambers, 2011	One month	Interviews, Motivational prompt. No significant effect.	Messages tailored to health benefits of stair use may be more effective

Table 1 Cont. Authors, Year	Length of Study	Prompt Used, Significant Findings	Future Research
Anderson, 2011 (Unpublished)	Nine weeks	2 motivational posters were used and data was collected for 1 hour, two days a week, for 9 weeks. Signs had no significant impact on stair use.	Research collected in other public area, as well as impact assessment on building's construction effect on stair climbing
Boen, Maurissen, Opdenacker, 2010	Three Interventions 1. Four days (2.25 hours each day) 2. Four days (2.25 hours each day) 3. Five days (3 hours each day)	Health Sign. Significant increase in stair use was found in a mall and two train stations. Post-intervention phase was significantly higher than baseline.	Further studies should focus on establishing long term effects of health signs and explore consequences of multiple exposures
Muller-Riemenschneider, Nocon, Reinhold, Williach, 2010	Ten weeks	Motivational Posters. Significant effect of stair use increased in women.	Include a control group, economic evaluation
Meyer, Kayser, Kossovsky, Sigaud, Carballo, Keller, Martin, Farpour-Lambert, Pichard, & Mach, 2010	Twelve weeks	Posters and floor stickers. Cardiovascular disease risk was reduced.	Larger randomized study in various environments and addressing long-term benefits of stair climbing and how to maintain stair use



Table 1 Cont. Authors, Year	Length of Study	Prompt Used, Significant Findings	Future Research
Pillay, Kolbe-Alexander, Achmat, Carstens, Lambert, 2009	Three weeks	Motivational Signs. Stair-promoting interventions are a viable strategy for increasing physical activity.	Further research to determine the modest incidental activity's effect on overall physical activity
Eves, Webb, Mutrie, 2006	Eight weeks	Posters. Significant increase in effect of stair use was greater in obese individuals.	Separate the two directions of travel on the stairs
Webb and Eves, 2006	Three weeks	Type of motivational message. Messages focusing on specific consequences are more persuasive.	Find ways to affirm the information presented on prompts may increase efficacy of stair-climbing interventions
Dolan, Weiss, Lewis, Pietrobelli, Heo, & Faith, 2006	N/A	Introducing motivational prompts increased stair usage by an average of 2.8%.	Starting BMI values for participants should be recorded for more precise projections about changes in obesity
Auweele, Boen, Schapendonk, & Dornez, 2005	Four weeks	Health sign, email. Stair use increased when the sign was introduced. Stair use increase was even more significant (85% vs. 77%) after the email was sent.	Future research should a way to identify the stair use of each employee while ensuring a sense of anonymity

Table 1 Cont. Authors, Year	Length of Study	Prompt Used, Significant Findings	Future Research
Adams & White, 2002	Five studies 1. 45 minutes 2. N/A 3. N/A 4. 12 weeks 5. N/A	Motivational posters and interviews. These studies did not show a significant increase in stair use.	Observations made on more than one floor, as well as a comparable control
Titze, Martin, Seiler, and Marti, 2001	6. Four months	Written information about recent physical activity recommendations, offerings of fruit, one day of elevator closure. After four months stair use in four offices increased, but was only significant increase in one of the offices.	A solution needs to be found for a covered evaluation of stair use for more results
Kerr, Eves, & Carroll, 2000	Six weeks	Interviews and posters. Stair use increased during intervention periods.	A need for strategies that direct pre-contemplators' attention to environmental cues for exercise

## CHAPTER II

### METHOD

This study investigated the use of motivational prompts in the form of emails and posters in encouraging stair use among employees in a building. The study used electronic “people counters” to keep track of stairwell and elevator use in the building.

#### *Participants*

The participants in this study were employees in an administrative building at the University of North Dakota. Outside visitors to the building who used the stairs or elevator were also counted during the intervention. The participants were both males and females, ages ranging from college entry age (approximately 18) to retirement age. These ages are estimates as the counters did not provide this information. The duties of the employees in this building would be considered predominantly sedentary.

#### *Building layout*

The intervention took place in a four-story administration building on the university campus. The main staircase and adjacent elevator face the main entry doors of the building, and were monitored during the study. A minor staircase, situated at the end of a wing of the building that leads to the building’s snack bar was also monitored. The main staircase and elevator are used by employees, and probably by most visitors to the building given their placement by the main entry doors. The minor “snack bar” staircase is likely mostly used by building employees because most visitors would not be aware of its existence unless they were familiar with the layout of the building. The placement of

the main staircase plays an important role in this study because individuals entering the building through the main doors to visit floors two through four have to immediately decide whether to use the stairs or elevator.

### ***Wireless Counters***

Six pairs of Counting Technologies wireless “people counters” were used to count pedestrian traffic at the bottom and top of two staircases, and at the first floor and fourth floor openings of an elevator for fifteen days. The Counting Technologies’ wireless counters are 3.6v AA battery operated; consisted of a pair of automatic counters (one transmitter and one receiver) in which an invisible infrared beam is projected between. The counters are capable of covering a twenty-five foot separation. The total count of passes through the beam is displayed on an LCD display on top of the receiver counter.

### ***Emails***

One email was sent to each building employee through an existing listserv every day for the five days of the intervention period. An administrative assistant of the building sent the email to each department head of the building, instructing them to forward the email to their departments. These emails (See Appendix A) were specifically written using the tenets of SDT specifically to promote feelings of autonomy, competence, and relatedness, as well as identified regulation.

### ***Posters***

Twelve posters positioned in the stairwell and outside of the elevator were also used to encourage stair use during the five days of the intervention period. These posters depicted messages related to the four SDT factors (autonomy, relatedness, competence, and identified regulation). Four posters were displayed in each stairwell, as well as one

poster outside of each elevator opening. The posters were rotated twice a day during the intervention stage to ensure that employees were exposed to multiple messages. (Table 2).

Table 2. Poster’s Motivational Messages

Message	Relation to SDT (Competence, Autonomy, Relatedness, Identified Regulation)
Become a Master of the Stairs	Competence
Why Use the Stairs? For the Health of it!	Identified Regulation
Stairwell to Health This Way	Identified Regulation
The Stairs... You Can Do It!	Competence
Before Work, After Work, During Lunch... Its Your Choice When to Take the Stairs	Autonomy
Conquer Mt. Everest in Your Workplace, Take the Stairs	Competence
Step Towards A Healthier Future!	Identified Regulation
Friends Don’t Let Friends Use The Elevator	Relatedness
You Burn 8.6 Times More Calories Taking the Stairs than Standing Still	Identified Regulation
Don’t Just Stand There, Take the Stairs!	Identified Regulation
No Waiting for the Stairs	Autonomy
Take the Steps Towards Health!	Identified Regulation

***Procedures***

Monitoring of stair and elevator use took place every Monday through Friday for fifteen weekdays, over three consecutive calendar weeks. The monitoring of the people counters was conducted each weekday at 7:15 a.m. and 5:00 p.m. During the first five days of the intervention period no poster or email prompts were used in order to obtain baseline counts of stair and elevator use. The following five days the posters were displayed in the stairwells, and the email prompts were sent out to the employees once a day, between the hours of 8:00am and 9:30am. The posters were removed on the evening

of the tenth day of intervention. The emails discontinued after this day as well, in order to document post-intervention stair and elevator use. The researcher recorded counts from the counters Monday through Friday, to get a total number of counts for each day. A questionnaire (See Appendix B) was sent out electronically through the email listserv on the Monday following the last day of post-intervention data collection, Friday the 22<sup>nd</sup> of June, 2012. The recipients were give five days (Monday to Friday) to answer the questionnaire.

Conducting the stair use intervention during the summer time may have helped to give a more accurate reading of stair use by employees of the University building, as student traffic likely decreases during summer months. However, because of new enrollment, the number of new visitors to the building may have increased. The time period of the study was chosen to avoid any maintenance to the building that could have affected the counts.

### ***Design and Analysis***

This observational study obtained a baseline count of stair and elevator use for five consecutive days, followed by a five-day intervention, and finally a five-day follow-up. Use rate was determined by calculating raw percent and change was determined by calculating relative percent change (baseline % minus intervention % divided by baseline %). Chi –square tests were computed to test the statistical significance of stair versus elevator use change over the course of the study. Single-sample *t*-tests were computed to see if the questionnaire responses indicated that the motivational posters and messages were effective.

## CHAPTER III

### RESULTS

This study investigated the effect of using motivational prompts in the form of emails and posters encouraging stair use among employees in a building. The study used electronic “people counters” to keep track of stairwell and elevator use in the building.

#### *Counters*

Two stairwells and an elevator were monitored at the first floor and fourth floor for fifteen weekdays in a University building. A significant increase in all indices of stair use was observed from baseline to intervention period. Overall, stair use increased from 57.22% to 61.21% (relative change 6.97%), and the increase was especially apparent in relation to the stairs leading to the snack bar, from 9.14% during the baseline data collection to 11.26% (relative change 23.19%) during the intervention data collection period. (See Table 3 for all stair use changes.)

Table 3. Chi-Square Analyses of Stair Versus Elevator Use Change

	Baseline (% total)	Intervention (% total)	Relative Change	$\chi^2$ ( <i>p</i> value)	Follow-Up (% total)	Relative Change	$\chi^2$ ( <i>p</i> value)
1st Main Stair	3911 (54.65%)	3872 (56.14%)	2.73%	12.18 ( <i>p</i> < .001)	4095 (55.45%)	1.46%	.84 (NS)
1 <sup>st</sup> Snack Stair	640 (8.94%)	755 (10.95%)	22.48%	24.81 ( <i>p</i> < .001)	650 (8.80%)	1.57%	.001 (NS)
1 <sup>st</sup> Overall Stair	4551 (63.60%)	4627 (67.09%)	5.49%	18.88 ( <i>p</i> < .001)	4745 (47.45)	1.02%	.676 (NS)
4 <sup>th</sup> Main Stair	1006 (32.76%)	1132 (36.27%)	10.71%	14.29 ( <i>p</i> < .001)	1121 (11.95%)	5.83%	5.68 ( <i>p</i> < .05)
4 <sup>th</sup> Snack Stair	295 (9.61%)	373 (11.95%)	24.35%	14.69 ( <i>p</i> < .001)	382 (11.82%)	23.00%	11.10 ( <i>p</i> < .005)
4 <sup>th</sup> Overall Stair	1301 (42.36%)	1505 (48.22%)	13.83%	21.43 ( <i>p</i> < .001)	1503 (46.49%)	9.75%	10.85 ( <i>p</i> < .005)
Main Comb. Stair	4917 (48.08%)	5004 (49.95%)	3.89%	20.83 ( <i>p</i> < .001)	5216 (49.12%)	2.16%	4.25 ( <i>p</i> < .05)
Snack Comb. Stair	935 (9.14%)	1128 (11.26%)	23.19%	18.73 ( <i>p</i> < .001)	1032 (9.72%)	6.35%	4.00 ( <i>p</i> < .05)
Over Comb. Stair	5852 (57.22%)	6132 (61.21%)	6.97%	33.33 ( <i>p</i> < .001)	6248 (58.84%)	2.83%	5.63 ( <i>p</i> < .05)

*1<sup>st</sup> Main Stair = Count of building's main stair case on the first floor*

*1<sup>st</sup> Snack Stair = Count of first floor stair case leading to the building snack bar*

*1<sup>st</sup> Overall Stair = Total of first floor main and snack stairs*

*4<sup>th</sup> Main Stair = Count of building's main stair case on the fourth floor*

*4<sup>th</sup> Snack Stair = Count of fourth floor stair case in front of building's snack bar*

*4<sup>th</sup> Overall Stair = Total of fourth floor main and snack stairs*

*Main Comb. Stair = Total of first and fourth floor main stairs*

*Snack Comb. Stair = Total of first and fourth floor counts for the stairs leading to snack bar*

*Over Comb. Stair = Total of all counts*

Stair use was shown to increase during the intervention period and drop during the post-intervention (see Figure 2.) The relative change of stair versus elevator use for each stair case is shown in Figures 3, 4, and 5.



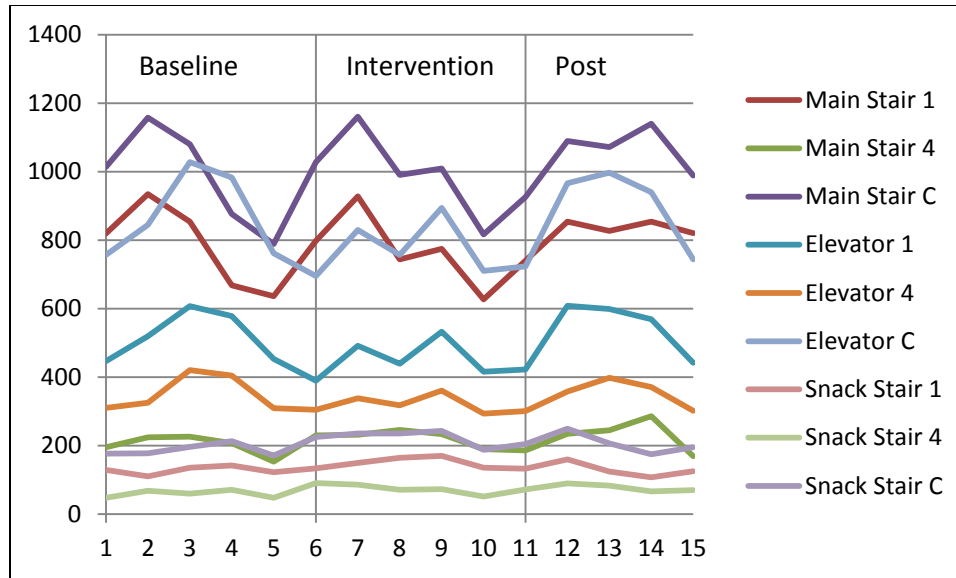


Figure 2. Stair and Elevator Use  
*Stair use changes during baseline, intervention, and post intervention.*

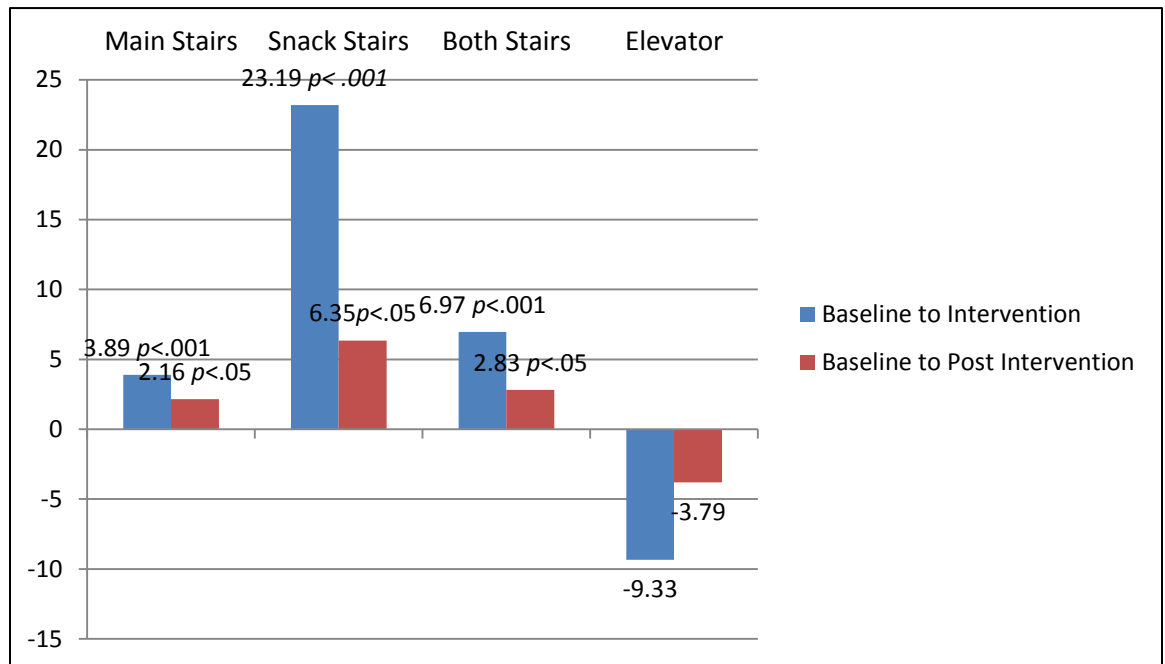


Figure 3. Relative Change of First and Fourth Floor Counts  
*Significant increase from baseline to intervention stair use was seen at both floors where counts were recorded.*

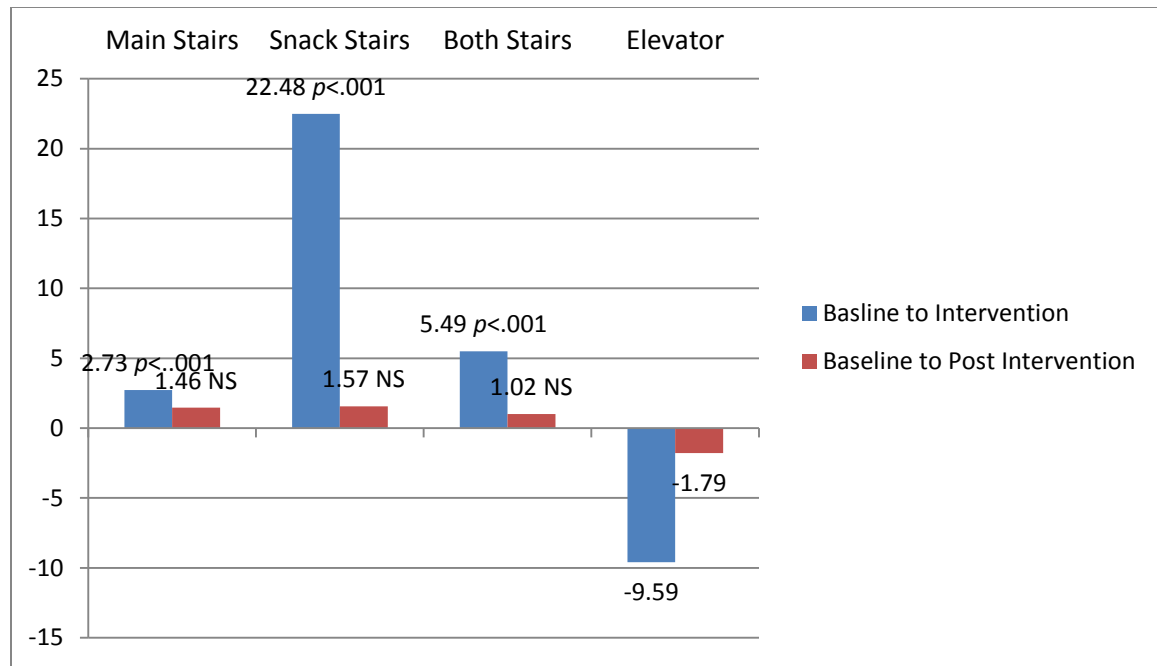


Figure 4. Relative Change of First Floor Counts

*A significant increase in stair use was seen at all first floor staircases, shown as p values.*

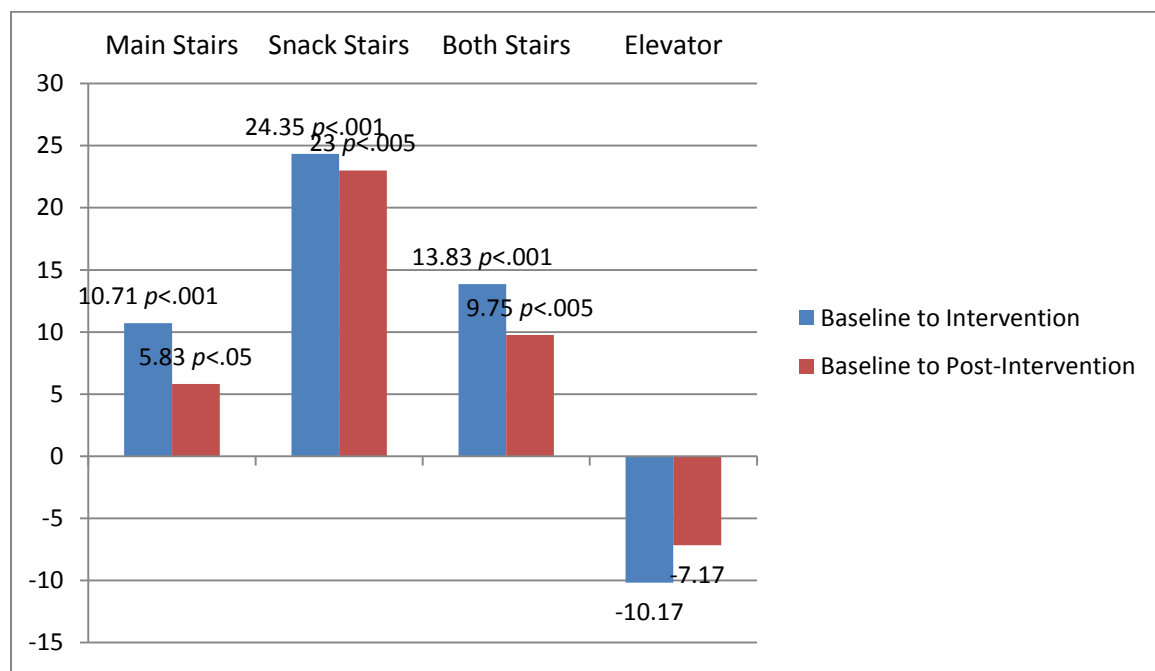


Figure 5. Relative Change of Fourth Floor Counts  
*A significant increase difference of baseline versus intervention stair use was seen at fourth floor stair cases. Significance shown as p values.*

### ***Questionnaire Responses***

Sixty-four responses were received from roughly 195 employees in the building (according to the building directory). Thus, the response rate was approximately 33%. The mean age of respondents was 41.11. Thirteen males and forty-six females responded to the questionnaire. Number of respondents from the first, second, third, and fourth floor offices was 16, 11, 15, and 16, respectively. One respondent did not indicate which floor his/her office was located. Forty-seven respondents indicated that they made use of the stair cases prior to the intervention, while ten indicated they did not make use of the stairs prior to the intervention (Figure 7). Thirty-nine respondents indicated that they met the daily requirements of thirty minutes of physical activity a day before the intervention. (See Figure 6.)

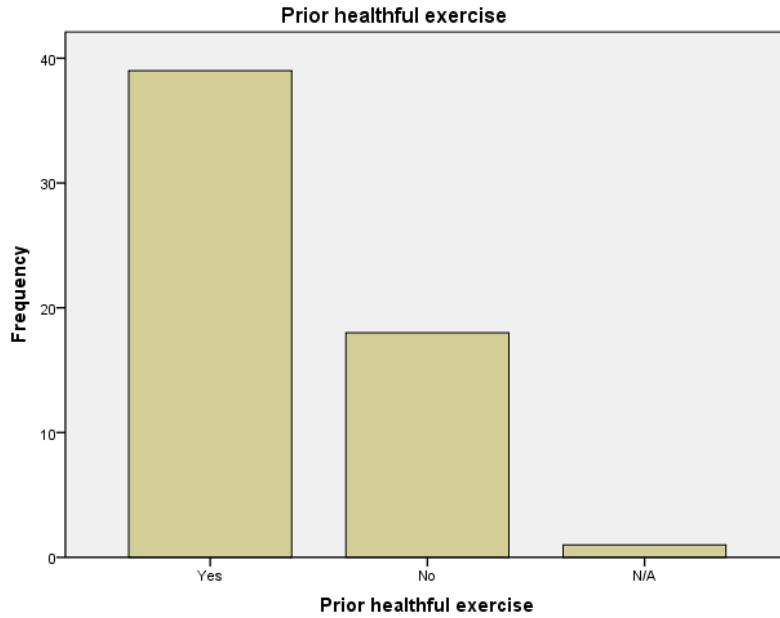


Figure 6. Prior Healthful Exercise  
*Individual responses to meeting 30 minutes of physical activity most days of the week prior to the intervention*

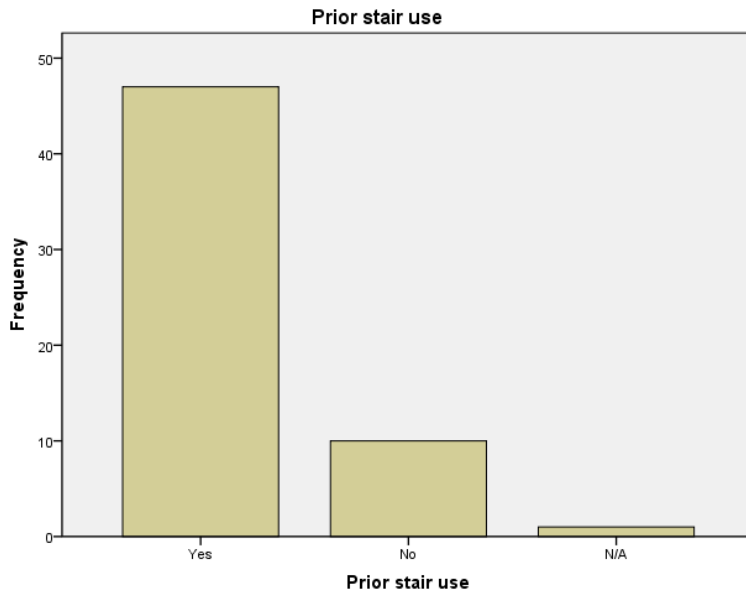


Figure 7. Prior Stair Use  
*Individual responses to the question of stair use prior to the intervention.*

Single-sample *t*-tests were computed to contrast the mean scores of the four SDT items with the theoretical mid-point (five) of the response alternatives--which would

theoretically indicate no change in their feelings. It should be noted that the original response scales (paper version) specifically specified that “5” indicated “no change”—but that verbal descriptor was inadvertently omitted from the electronic version, and consequently, there may have been some confusion regarding the meaning of numbers between one and five on the response scale. If respondents were confused, it would seem most likely that they assumed those numbers signified an increase in feelings—so regarding a score of “5” as the theoretical mid-point would make the analyses more conservative (i.e., less likely to have inflated results).

The single-sample *t*-test of the identified regulation question showed that the mean scores were significantly higher than the theoretical midpoint ( $M = 6.24$ ,  $SD = 3.06$ ;  $t(45) = 2.74$ ,  $p < .01$ ). Those responses (see Figure 8) to messages adapted using the ID sub-theory of SDT suggested that encouragement of stair use was effective among most employees. Similarly, the autonomy question ( $M = 7.08$ ,  $SD = 2.85$ ;  $t(48) = 5.11$ ,  $p < .001$ ) (Figure 9) and the competence question ( $M = 6.57$ ,  $SD = 2.81$ ;  $t(43) = 3.71$ ,  $p < .005$ ) (Figure 10) also showed that these applications of the tenets of SDT encouraged employees to use the stairs. In contrast, the data from the relatedness question (“climbing the stairs made you feel more socially connected to others in the building”) suggested that using the stairs made individuals feel less connected to others in the building ( $M = 3.25$ ,  $SD = 2.94$ ;  $t(44) = -4.00$ ,  $p < .001$ . See Figure 11).

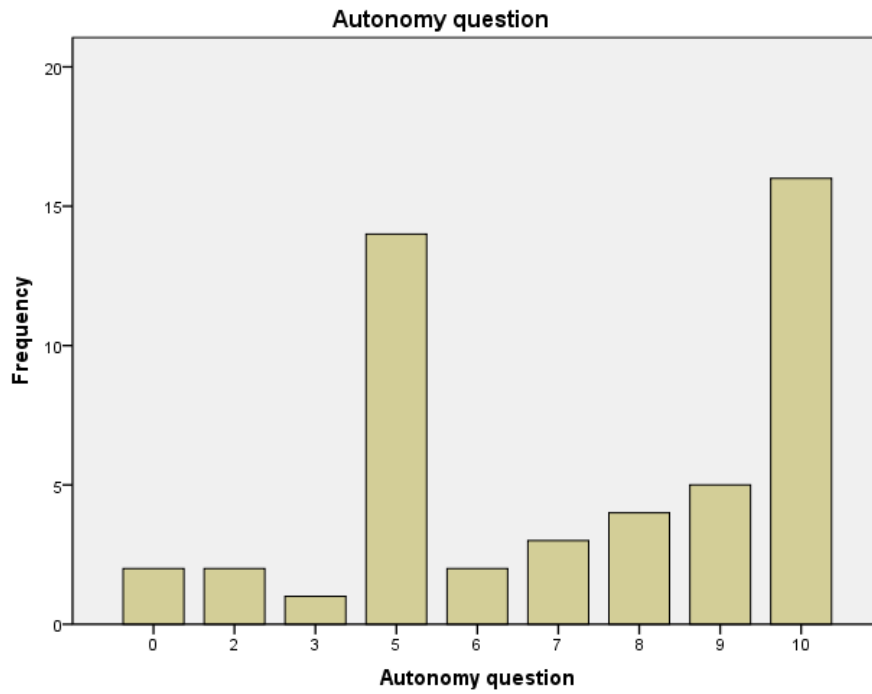


Figure 8. Individual Responses to the Autonomy Question

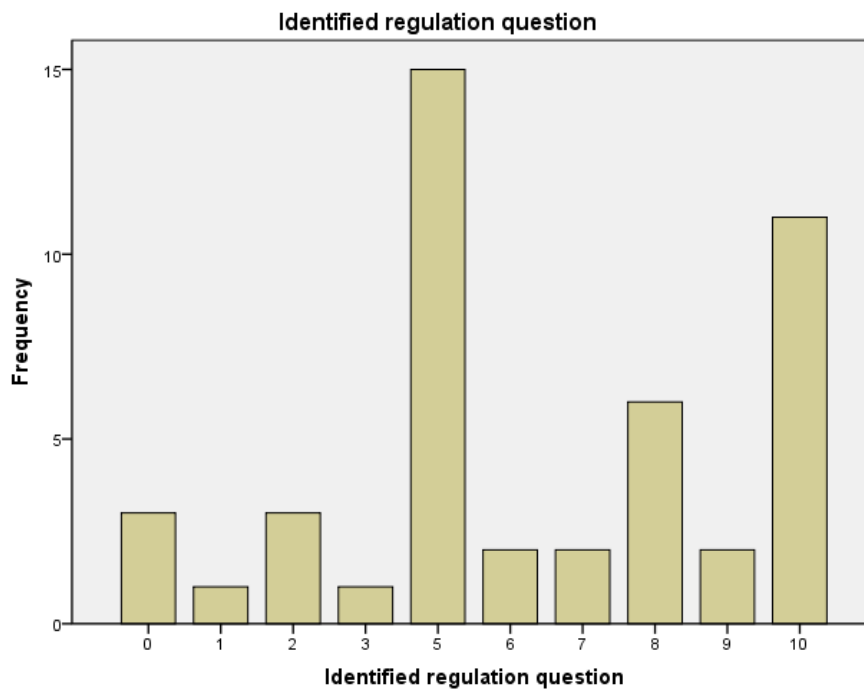


Figure 9. Individual Responses to the Identified Regulation Question

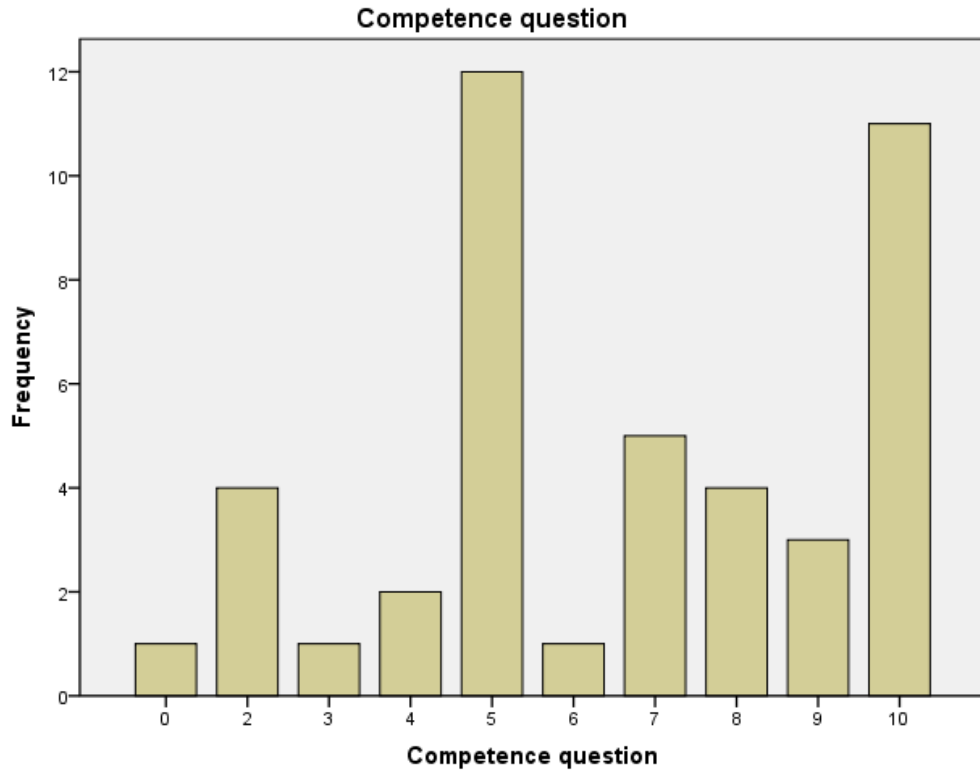


Figure 10. Individual Responses to the Competence Question

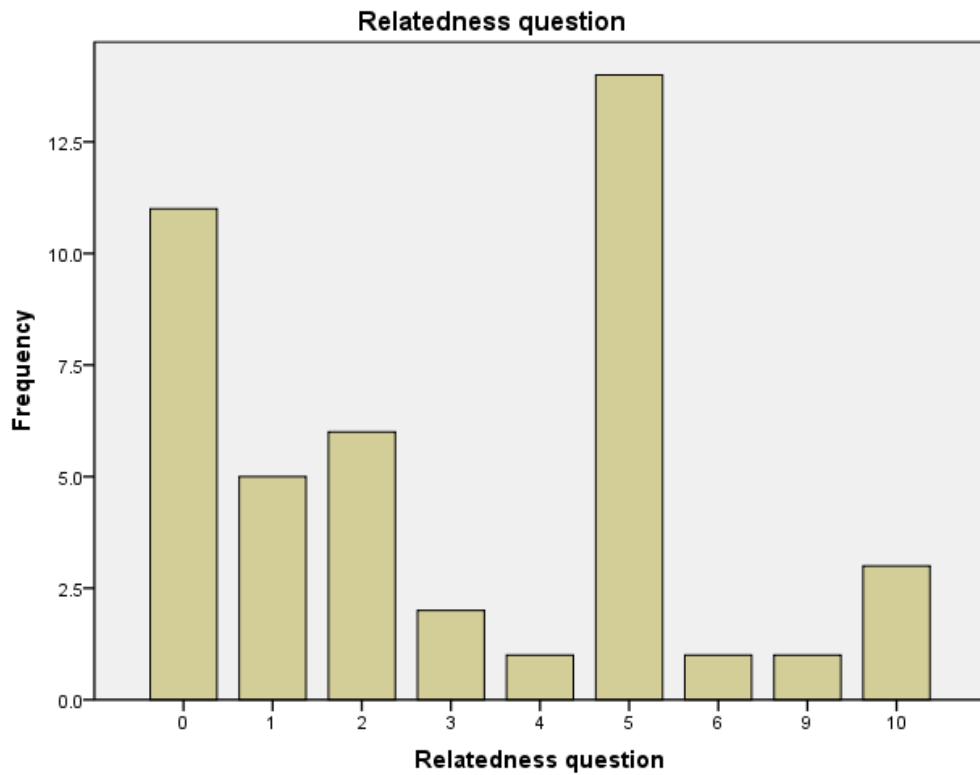


Figure 11. Individual Responses to the Relatedness Question

The comparisons of the mean scores for the four motivation questionnaire items with the theoretical mid-point of the response scale (a score of “5”) are summarized in Figure 12 below.

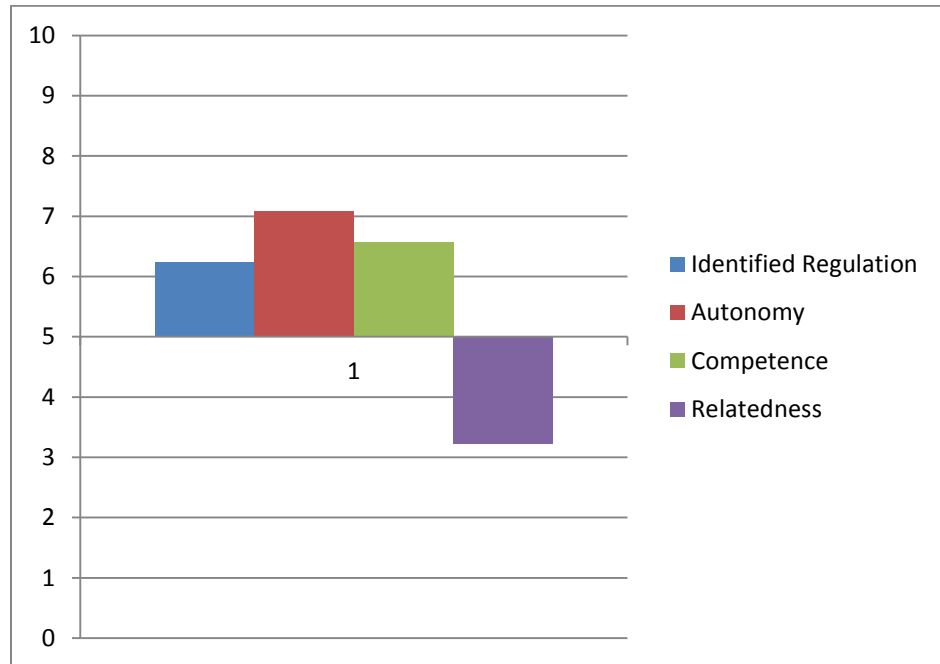


Figure 12. Questionnaire Response Summary



## CHAPTER IV

### DISCUSSION

This study investigated the effect of using motivational prompts in the form of emails and posters to encourage stair use among employees in a building. The study used electronic “people counters” to keep track of stairwell and elevator use in the building.

Promoting stair use among individuals in a building has been a popular subject for research in recent years. Many interventions have looked at using motivational messages to promote stair use in employees. However, few, if any have looked at using motivational messages theoretically derived from SDT to promote stair use in employees. This intervention did successfully increase stair use during the week of the intervention. These findings may have provided evidence that SDT helped to encourage stair use.

The staircase that leads to the building snack bar saw the biggest increase in use during the intervention period. Employees of the building are the most likely users of this staircase because most visitors would be unaware of its existence. Visitors are faced with an immediate choice of using the main staircase and elevator when they enter the building because the staircase and elevator are situated side-by-side immediately inside the main entrance. In contrast to building visitors, the employees received the emails in addition to the poster-prompt element of the intervention—so it is logical to infer that the e-mail prompts were a major factor in the different relative change percentages. This inference appears to have some logical support from the data of Webb and Smith (2010) which showed that interventions aimed at increasing stair use are usually less effective

when the stairs are remotely located, so in this case it is difficult to conjecture that factors other than the e-mails could have made the difference.

Additional support for the former logic may come from the study by Auweele, Boen, Schapendonk, & Dornez (2005) which utilized a similar intervention to the present study where health promotion signs were displayed by each staircase and elevator in a building. The authors reported that the posters encouraged stair use in the building, but when e-mail messages were added, an even larger increase in stair use was documented. However, these authors did not focus on the type of motivational message that was displayed on each sign, and indeed, Webb and Eves (2006) found that most studies related to stair use promotion have not focused on the type of message portrayed on the stair prompts. Since no direct contrast in types of motivational messaging (e.g., theory-based versus general) was attempted in this study, no unequivocal conclusions can be made as to whether motivation-based messages are more effective than others—but the large relative increase in the snack stair percentage during the intervention does suggest the possibility of some extra effect.

The placement of motivational posters may play an important role in an intervention especially where an elevator and staircase are situated next to each other so that individuals in the building that need to go to a different floor to have to make a choice between the two. Lewis and Eves (2012) found that an established habit, such as elevator use in a building, will cause a person to always take the elevator because the habit has become subconscious. Adding an overt motivational prompt can encourage more stair use in individuals who would have otherwise followed their habit of consistently taking the elevator.

It is difficult to draw conclusions from the analyses of the questionnaire items in this study because of the possible confusion stemming from the omission of the “no change” verbal descriptor from the mid-point of the scoring scales. However, even if respondents did still see numbers less than five as indicating a reduction of motivational perceptions, increased perceptions of autonomy, competence and identified regulation all appeared to have a positive effect in promoting stair use among employees. However, if that was the case, the relatedness item on the questionnaire did not increase the feeling of “connectedness” among employees. If so, we conjecture that the language of the relatedness question may have led respondents to misinterpret the question. One hypothesis to this reasoning is that the individuals found using the stairs made it physically harder to interact with another individual than standing in an elevator would.

In terms of the practical significance of increasing stair use, some analysis of the energy cost is of interest. According to the National Institute for Fitness and Health, an average 150-pound person burns seven calories for one minute of stair use. If the person chose to use the stairs for five minutes, five days a week, for a year, they could potentially burn 9000 extra calories. This calorie burn could theoretically lead to a 2.5-pound weight loss every year, simply by choosing the stairs five minutes a day. (Cates, 2010) This information explains to individuals who work in a building with staircases, that they can help any weight loss they may be striving for by simply choosing the stairs for a mere five minutes during their work day. Incidental activity, such as parking further away from a destination, or choosing the stairs over the elevator, can be a very useful tool to those who want to shed excess weight.

### ***Limitations***

The questionnaire responses received in this intervention were predominantly from women. Muller-Riemenschneider, Nocon, Reinhold & Williach (2010) conducted stair use intervention in underground stations in Berlin and found that the stair use prompts had a more positive effect on women than on men. These observations may be because women are more receptive to stair use prompts. It also may be that men are less likely to change their behaviors than women. The counters were not able to differentiate between males and females, leaving the question of whether or not gender plays a role in the effect of motivational prompting unanswered. Other factors, such as physical restrictions to stair use, were not researched in this study. The intervention period was a short one, a longer intervention period might have a better chance at encouraging adherence to stair use during the workday. The counters could have incorrectly counted large items, such as carts or garbage cans. Future studies should look at total building counts by positioning counters at each opening of the building.

The intervention showed an effect of increased stair use when using motivational prompts based upon SDT. Because of the study design we cannot unequivocally say the motivational messaging helped the effect, but increase in the use of the stairs leading to the building's snack bar supports this claim. Future studies could have contrasting interventions to help answer this question.

As noted in the results section, because the verbal descriptor signifying a score of "5" as meaning "no change" was inadvertently omitted from the computer questionnaire, respondents may have considered any response above a zero on the Likert-type scale questions to mean a small increase, rather than the midpoint of five meaning neutral. If

so, the analyses used may mean that the motivational messages had a stronger effect than what is portrayed in Figure 12. However, because any confusion would have introduced unnecessary response error, the clarity of the results was likely to have been reduced.

This intervention provided data that motivational messages in the form of daily emails and posters may encourage employees to use the stairs at their place of work. Employees who regularly incorporate more physical activity into their workday in the form of stair use may benefit from positive impacts on their health, such as weight loss, better cardiovascular fitness, and less risk of diseases related to prolonged periods of inactivity.

Stair use quickly decreased after the intervention period ended. This observation suggests that longer intervention periods are needed to help individuals develop the habit of taking the stairs over the elevator. A longer intervention period will also provide more insight on the effect of motivational prompts encouraging stair use.

## APPENDICES

## Appendix A

### Emails

#### **OPENING EMAIL**

Hello There –

The Health and Wellness Unit at the University of North Dakota is working on promoting more physical activity across campus. Physical activity during the day can help alleviate stress, burn calories, and help you to achieve the recommended 30 minutes of physical activity a day. And remember, even small ten-minute bouts of physical activity count! (CDC, 2011).

One way to acquire more physical activity into your day is by using stairs instead of the elevator on breaks, during lunch, and before and after work. Stair use burns 8.6 times more energy than standing still (such as in an elevator)! We are promoting stair use in Twamley. Just using the stairs for a few minutes during breaks can help you achieve better health and wellness!

Look for windows of time in your day to fit a little physical activity in simply by taking the stairs!

Happy Climbing!

#### **IDENTIFIED REGULATION**

Hello!

I hope you've been able to enjoy the new posters displayed in the stairwells and outside the elevator in Twamley. If you haven't had this chance yet, take a few minutes to climb the stairs, check out the new posters, and accumulate some of your daily physical activity! Stair climbing may not be the most exciting method of physical activity, but it can help you to achieve better health and wellness levels!

Did you know that taking the stairs actually helps to save the environment by saving electricity used by the elevator? Exercise obtained from stair use stimulates blood flow to the brain; it makes you smarter! You also burn five times more calories using the stairs rather than the elevator! Why not choose the stairs?

Better Health One Step at a Time!

## **COMPETENCE**

Hello!

I hope you've been able to participate in a little bit of extra physical activity the last couple of days by using the stairs. Remember, you do not need to climb 10 flights at one time to start achieving health benefits! The more you use the stairs the more you'll be able to climb each time! Setting a goal of stair use can help you to master the challenge – one step at a time!

Happy Climbing!

## **RELATEDNESS**

Hey there –

A quick tip to increasing your daily stair use is to find a friend or co-worker to take the stairs with! Set daily “stair dates” with each other during much needed short breaks at work during the day!

Also, role models can be a powerful thing. Maybe you are exceptionally good at getting your stair use in during the day. Why not encourage a co-worker in their stair use as well?

Reach for the Stairs!

## **AUTONOMY**

Hello -

The freedom of choice is a wonderful thing. When looking for opportunities to use the stairs remember to keep in mind that it's your choice when you choose to use the stairs. Whether it's before work, after work, during lunch breaks or any other breaks you may have during the day choose the stairs at any time during the day helps you to accumulate health promoting physical activity!

Reach for the Stairs!



## **QUESTIONNAIRE EMAIL**

Stair Master -

I hope the emails you received, and the posters that were displayed in Twamley have helped encourage you to use the stairs.

It would be very helpful if you would fill out the following questionnaire regarding the emails and posters that were used to encourage stair use. Your feedback is very important to us. The questionnaire is completely voluntary and your answers are completely anonymous. Please email Bethany Brandvold if you have any questions about this.

Thank you for your time.

Bethany Brandvold

[Bethanybrandvold@gmail.com](mailto:Bethanybrandvold@gmail.com)

Appendix B  
Questionnaire

*What is your age?*

*What is your gender?*

Male  
Female

*Which floor is your office located on in Twamley?*

First  
Second  
Third  
Fourth  
N/A

On a scale from 0 to 10, 0 meaning the feeling was reduced and 10 meaning the feeling was increased, did the emails/posters make you feel that...

0 1 2 3 4 5 6 7 8 9 10 N/A

*Climbing the stairs was worth the effort because of the health and wellness benefits?*

*Climbing the stairs was a personal choice?*

*Climbing the stairs was a task that you could confidently master?*

*Climbing the stairs made you feel more socially connected to others in the building*

*Prior to this campaign to encourage stair use, did you make use of the stairs?*

Yes  
No  
N/A

*Prior to this campaign to encourage stair use, did you meet the requirements of 30 minutes of physical activity a day, most days of the week?*

Yes  
No  
N/A

Appendix C  
Motivational Posters

**Don't Just Stand  
There...**



**Take the  
STAIRS!**

# Become a Master



**Of the  
Stairs!**

# You Burn 8.6 Times More Calories



**Taking the Stairs  
Than Standing Still**

# Conquer Mt. Everest in Your Workplace...



**Take the Stairs!**

# Take the Steps



# Towards Health!



# Why Use the Stairs?



**For the Health of it!**

# **Before Work, After Work, During Lunch...**



**You Choose When  
to Take the Stairs!**

# Stairwell to Health



## This Way



# Friends Don't Let Friends...



**Use The Elevator**

# The Stairs...



**You Can Do It!**

# Step Towards



**A Healthier  
Future!**

# No Waiting For the Stairs



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