2005

Decreasing Elevator Travel in Women With Sign Prompts Encouraging Stair Use

Matthew S. Mura

DECREASING ELEVATOR TRAVEL IN WOMEN WITH SIGN PROMPTS ENCOURAGING STAIR USE

by

MATTHEW S. MURA

(Under the Direction of A. Barry Joyner)

ABSTRACT

The purpose of this study was to determine if motivational signs encouraging stair use could decrease elevator travel in women. Observational data coded women using the elevator by direction of travel, ethnicity, and weight. After a 2-week baseline signs encouraging stair use were placed throughout the academic building. The signs were removed for a week of follow-up observations. An 8-question survey was also administered to 61 women. A trend towards significant decreases in elevator travel was found (p=.076). The greatest decreases occurred in African American, and overweight women. Eighty-eight percent of those surveyed, who were elevator users, reported the signs did prompt them to use the stairs over the elevator. The trend towards significance, coupled with the survey showing a high influence of the signs suggests a multi-placement prompt strategy may be beneficial in decreasing sedentary methods of travel in buildings where the probability of repeat travel is high.

INDEX WORDS: Physical activity intervention studies, Point of choice prompts, Stair climbing

DECREASING ELEVATOR TRAVEL IN WOMEN WITH SIGN PROMPTS ENCOURAGING STAIR USE

by

MATTHEW S. MURA

Methodist College, Bachelor of Science, 1998

Georgia Southern University, Master of Science, 2005

A Thesis Submitted to the Graduate Faculty of Georgia Southern University in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

STATESBORO, GEORGIA

2005

DECREASING ELEVATOR TRAVEL IN WOMEN WITH SIGN PROMPTS ENCOURAGING STAIR USE

by

MATTHEW S. MURA

Major Professor: A. Barry Joyner

Committee: A. Barry Joyner
Anthony V. Parrillo
Bryan Reimann

Electronic Version Approved:
2005

DEDICATION

I would like to dedicate this research to my wife Kimberly, and daughter Faith. Kim, I appreciate your unconditional support, understanding, and encouragement throughout. Faith, I love you.

ACKNOWLEDGEMENT

I would like to take this opportunity to thank my committee, Dr. A. Barry Joyner, Dr. Anthony V. Parrillo, and Dr. Bryan Reimann, for their willingness to be a part of this research, as well as their valuable insight, and suggestions throughout. I would also like to thank Jason Joyner for his help with data collection.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

America's struggle with weight has long been an issue of concern. As far back as 1960, 50% of men, and over 40% of women were labeled as overweight (Flegal, Carroll, Ogden, & Johnson, 2002). The Surgeon General suggests decreasing caloric intake while increasing physical activity as the most effect means for weight management (United States Department of Human Services). In 1995, the Center for Disease Control (CDC), and American College of Sports Medicine modified its daily physical activity recommendation to include 30 minutes of accumulated moderate intensity activity as an effective, and acceptable physical activity strategy to incorporate into ones lifestyle (Pate et al., 1995). Included among the appropriate modes of physical activity was stair climbing (Pate et al.).

Although modifications made to daily physical activity recommendations seem to make it easier to include physical activity as part of ones lifestyle, research does not concur. In a study done on over 180,000 adults age 18 and older throughout the United States (U.S.), the vast majority (74.4%) reported actively using some form of weight control strategy (Mokdad et al. 2001). Of this group, consciously monitoring weight, only 17.5% were using the fore mentioned Surgeon General weight control strategies (Mokdad, et al.).

When narrowing the focus of the data collected by Mokdad et al. (2001) to those with a Body Mass Index (BMI) $\geq$ 30, 86% were using some form of weight management technique. Although over 80% of this group, which would be classified as obese, were

attempting to control their weight, 63.7% admitted being completely inactive or not participating in physical activity on a regular basis (Mokdad et al.).

Stair climbing, an acceptable means of accumulating moderate intensity activity, may be especially appealing to women due to its accessibility, simplicity of movement, and health benefits. Females, in general, report having less access to areas conducive for physical activity than males (Brownson, Ross, Baker, Housemann, Brennan, & Bacak, 2001). Overall, the top three personal barriers women report preventing them from participating in physical activity on a regular basis are lack of time, lack of energy, and self-consciousness (Brownson et al., 2001). Also, the research by Coupland et al. (1999) finding a significant association between the number of stairs climbed daily and total body bone mineral density in postmenopausal women all seem to suggest developing physical activity interventions specifically prompting women to choose the stairs over the elevator/escalator as logical.

The CDC publishes the *Community Guide to Preventive Services* "…to provide public health decision makers with recommendations regarding population-based interventions to promote health and to prevent disease" (CDC, 2001a). The report on physical activity, which reviews the efficacy of interventions that increase exercise opportunities and facilitate and maintain changes in knowledge and attitudes about physical activity, was completed October 2001. The physical activity *Guide* (CDC, 2001b) is the by-product of 253 studies on school-based health education classes, organizational policies, social support mechanisms, behavioral reinforcement, and changes to the physical environment (Kahn et al., 2002). Recommendations (CDC, 2001c) are consistent with the *Guide* (CDC, 2001b), and conclude that point of decision

prompts are among the informational approaches with "…sufficient evidence…" (p.77) for increasing physical activity (Kahn et al., 2002).

There have been a myriad of study designs to encourage stair use over the elevator or escalator. Most point of choice research used motivational prompts encouraging stair use (Andersen, Franckowiak, Snyder, Bartlett, & Fontaine, 1998; Andersen, Franckoviak, Zurak, & Cummings, 2000; Blamey, Mutrie, & Aitchison, 1995; Brownell, Stunkard, & Albaum, 1980; Coleman, & Gonzalez, 2001; Kerr, Eves, & Carroll, 2001c; Marshall, Bauman, Patch, Wilson, & Chen, 2002; Russell, & Hutchinson, 2000). Other stair study designs used deterrent signs, stair rise banners, music and artwork in the stairwell coupled with signs, and manipulation of escalator function as a means of promoting decreases in elevator/escalator travel (Boutelle, Jeffery, Murray, & Schmitz, 2001; Faskunger, Poortvliet, Nylund, & Rossen, 2003; Kerr, Eves, & Carroll, 2001a; Kerr, Eves, & Carroll, 2001b; Kerr, Eves, & Carroll, 2001d; Kerr, Yore, Ham, & Dietz, 2004; Russel, Dzewaltowski, & Ryan, 1999).

Most studies were done within the community setting, such as a shopping mall, and bus or train station (Andersen et al., 1998; Andersen et al., 2000; Blamey et al., 1995; Brownell et al., 1980; Faskunger et al., 2003; Kerr et al., 2001a; Kerr et al., 2001b; Kerr et al., 2001c; Kerr et al., 2001d). These locations used one sign at a point of choice location between the stairs and escalator/elevator.

The Boutelle et al. (2001) study increased stair travel within an academic building on a university campus using signs containing a health message, coupled with adding artwork and music to the stairwell in an attempt to make a more aesthetically pleasing environment. One sign was placed at the point of decision between the elevator and

stairs; other signs were positioned above all elevator buttons in the building (Boutelle et al.). The use of more than one sign prompt in this setting seems valid due to the high likelihood of repeat travelers within the building during the same days and times over a given semester.

Therefore, the purpose of this research was to determine if motivational signs, placed at strategic locations throughout an academic building, would decrease elevator usage among females; potential differences by direction of travel, ethnicity, and observer estimates of body weight were also assessed. The study also sought to examine whether signs placed at locations other than those at "point of decision" would be more recognizable, and if participants felt there might be other motivational techniques that would prompt them to take the stairs over the elevator. Since physical activity is ranked as a leading health indicator, this study addressed two main foci included in *Health People 2010*: 1) to increase the amount of moderate or vigorous activity performed by those in all population subgroups; and 2) to increase opportunities for physical activity through creating and enhancing access to places and facilities where people can be physically active (United States Department of Health and Human Services, 2000). Since the Georgia Southern campus can be viewed as a community, this study was carried out to improve student health, the overall goal of the *Health Campus* initiative (American College Health Association, 2002).

CHAPTER 2

Methods

Setting

Data were collected in the College of Education building located on the campus of Georgia Southern University in Statesboro, GA. The building has four floors, three of which contain offices and classrooms; the fourth floor is a storage area. There is one elevator in the building, and three stairwells. The closest stairwell is located approximately 15 feet away from the elevator. The building is kept at a temperature between 70-72 degrees Fahrenheit.

Demographics of the College of Education

There are 2,774 students, and 70 faculty members in the College of Education. Seventy nine percent of full time education majors are female, and 78% classify themselves as white.

Procedures

Before data collection began, the study was reviewed and approved by the IRB. Two trained data collectors were used on different days and times. The primary investigator (PI) collected data every Monday and Wednesday between 12:45 P.M.-2:45 P.M. A second collector made observations Tuesday and Thursday from 10:20 A.M.-12:20 P.M.

The data collectors inconspicuously situated themselves in a location allowing for a clear line of site to the elevator entrance. Observers kept count of the number of women entering, and exiting the elevator on the first floor, and categorize them by direction of travel (up, or down), ethnicity (white, black, or other), and weight (overweight, not

overweight). Any woman carrying a heavy load, items larger than a purse, briefcase, or backpack, accompanied by children, or physically handicapped were not counted as an elevator traveler.

The week before data collection began both observers spent two hours collecting pilot data, to insure reliability, and familiarity of the collection procedures. The first 30 minutes of pilot data were collected with no instruction given. Interobserver agreement on elevator traveler was 86.9%, 100% for ethnicity, and 70% by weight. For the next five minutes the PI instructed the other observer on how to correctly code women by weight, race, and traveler by categorizing women walking through the lobby. Then, an additional 90 minutes of pilot data were collected. Interobserver agreement over the 90-minute period, proceeding training, was 96% for elevator traveler, 95.8% for ethnicity, and 91.6% for weight classification.

To further validate the study the PI showed up at three unannounced times during the Tuesday/Thursday collection period, and collected data with the second observer. In all, 255 minutes were spent collecting simultaneous data. A total of 114 observations were made accounting for 12% of all observations. During this time, interobserver agreement for elevator traveler was 98.2%, 99.1% for race, and 90.2% for weight classification.

Design

The research design followed an ABA format. The first two weeks of observations were used to gather baseline data. This was followed by a two-week intervention phase where a total of 11 motivational signs encouraging stair use were printed on colored paper and placed on the first three floors of the building. Following the

two-week treatment signs were removed, and a one-week follow-up collection period occurred.

During the one-week follow-up period, survey data were collected. Sixty-one women, 24 during Monday/Wednesday, and 37 during Tuesday/Thursday observation times were given an eight question survey (see Appendix C) regarding elevator use, and recall of the intervention components. Of those surveyed, 35 were classified as white, 26 as black. Twenty-four of the 61 women surveyed either came directly off the elevator, or entered the elevator immediately after filling out the survey. Before participating in the survey all women were given and signed an approved informed consent form.

Sign Locations

Four signs were placed on the first and second floor. Three signs were used on the second floor. On all floors, signs were placed at estimated female eye level in the women's bathroom, and above the drinking fountain, and above the elevator call buttons. On the first and third floors a fourth sign was placed midway between the elevator, and closest stairwell on a support column. The second floor had no such column, nor a location deemed appropriate as a point of choice location therefore a sign was not placed there (see Drawing 1 for schematic of floor plan and sign locations).

Sign Design

The signs were printed on 8 ½" X 11" orange, and yellow paper. The signs above the elevator buttons were 4 5/8" X 4 ¾". Each sign contained a motivational message associating stair climbing with health benefits, or weight control. Sign content consisted of one suggestion from the CDC's web site, three slogans from previous research

(Andersen et al., 1998; Blamey et al., 1995; Boutelle et al., 2001), and two created by the PI of this study.

The sign design used a modification of the CDC sign template which consists of a star like object located at the middle top of each sign, and a female figure walking up a flight of stairs located at the middle bottom of the sign (see Appendix D for sign content, Appendix E for intervention sign design example).

Building Activity At Data Collection Times

On Mondays, a total of 13 classes commenced, and/or concluded during the data collection time, 53.8% taking place on the second, or third floor (see Table 1). Tuesdays' data collection time had a total of 32 classes beginning, and/or finishing during the observation time, 53.1% of which took place on the second or third floor. On Wednesdays 43% of the 14 classes starting and/or finishing during the two-hour observation period took place on the second or third floor. During the 120-minute Thursday data collection times there were a total of 39 classes that begin, and/or conclude, 61.5% of which took place on the second, or third floor. During the five weeks of data collection all classes, but one, met at their assigned time, and location. The one class which did not meet during its regular time was located on the first floor, and did not do so on the Thursday of follow-up observation.

Data Analysis

The Chi-Square test was run to determine if there was an association in significant decreases in elevator travel among, and between, direction, weight, and ethnicity during the treatment phase when compared to baseline data. The alpha level was set at .05. Because the follow-up phase was one week shorter than both the baseline and treatment

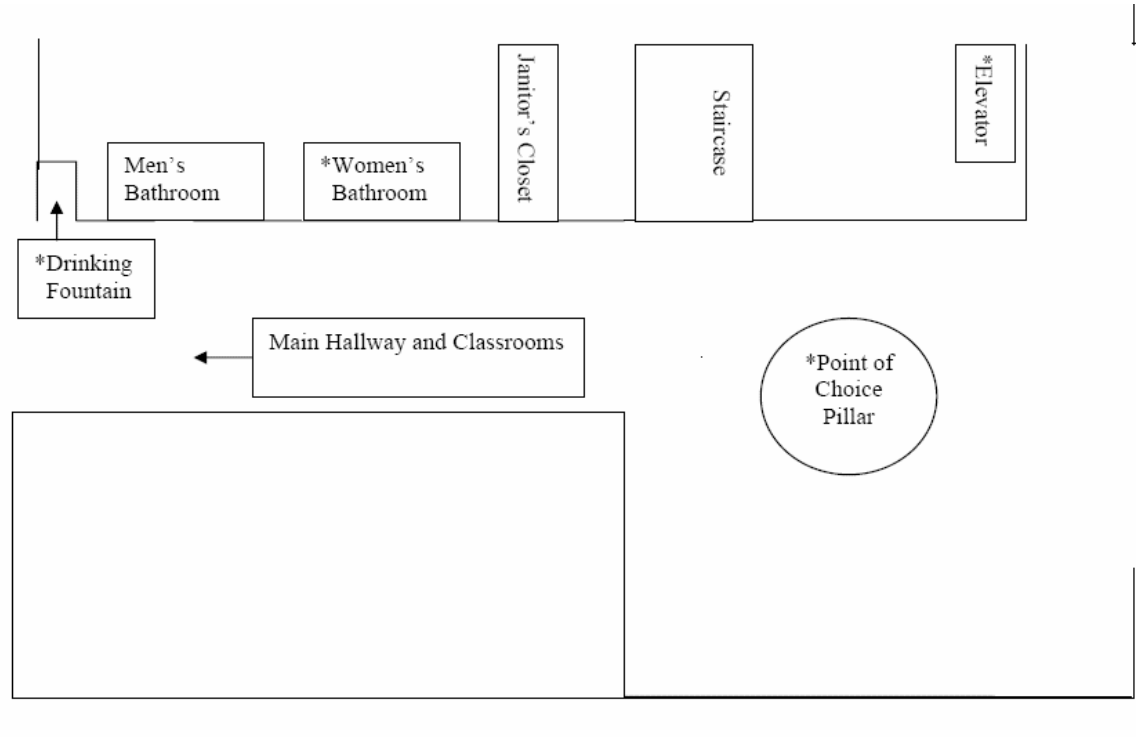
phases, follow-up observations were compared to the first week of baseline, and the last week of treatment elevator travel. Descriptive and frequencies were also run on observational, as well as survey data.

Tables and Figures

Table 1: Classes Beginning and/or Ending Each Day During Observation Hours

Day	# of Classes	% on 2nd or 3rd Floor
Mon	13	53.8%
Tue	32	53.1%
Wed	14	43%
Thu	39	61.5%

Figure 1: Drawing of Floor Layout Showing Where Elevator, Staircase, and Signs Were Located



* Location of signs

CHAPTER 3

Results

Due to an unforeseen event that happened within the College of Education community the Dean of the College of Education asked that the placement of the signs be postponed by one week. This request was not submitted to the primary investigator of this study until immediately after the two-week baseline phase. Therefore there was a one-week non-observation period between the baseline and treatment phases, and the follow-up phase was reduced to one week. This changed from the initial research proposed of two weeks of baseline, intervention, and follow-up observations with no breaks between phases.

Observation Data

A total of 951 women who met the inclusion criteria were observed using the elevator over the five weeks of observations. Although not significant (p =.076), elevator travel did decrease by 12.1% (n=49) between baseline, and treatment (see Table 2). During the weeklong follow-up phase elevator use increased by 16.9% (n=27) when compared to the last week of the treatment phase (see Table 3) (p.>05). This was still more than 13% (n=28) lower than the first week of baseline elevator travel *(p.>05).*

Elevator Travel by Direction

No significant differences were found within, or between directions of travel (p>05). Nearly 64% (n=605) of elevator travelers were observed getting on the elevator over the duration of observation. Women getting off the elevator decreased by 14.8% (n=22) during the intervention phase (p> .05) (see Table 4). Women entering the elevator also decreased (6.5%, n=27) during treatment when compared to baseline (p> .05). Once

the signs were removed women getting on the elevator increased 19% (n=38) when compared to the last week of treatment (see Table 5) (p> .05). This was still 6.7% (n=17) lower than the first week of baseline data collection. Female elevator travel down also increased during the week-long follow-up phase (7.9%, n=10), but was still 8.1% (n=12) lower than week one of baseline (p> .05).

Elevator Travel by Weight

Although no findings were significant (p> .05), over 58% (n=441) of all elevator travelers were classified as overweight. Elevator use in overweight women decreased by 17% (n=41) from baseline to treatment (see Table 6). During follow-up observations overweight women increased their elevator travel by 28.4% (n=25) from the last week of treatment observations (see Table 7). This was still 7.3% lower than data collected during the first week of baseline. Of those females categorized as not overweight, elevator use decreased by 4.8% (n=8) from baseline to treatment (see Table 6). During the one-week follow-up phase elevator travel among women who were not overweight had risen 4.1% (n=3) from the last week of treatment data, but was still 19.3% (n=18) lower than the first week of baseline observation (see Table 7).

Elevator Travel by Ethnicity

Overall, elevator travel between women categorized as black, and white throughout the five weeks was even (n=468, n=467). Among white females, elevator travel decreased by 7% (n=14) from baseline to treatment (see Table 8) (p> .05). During the one-week follow up phase white elevator use increased 5.1% (n=8) from the last week of the sign intervention (See Table 9) (p> .05). This was still 17.1% (n=34) lower than week one of baseline observations (p> .05).

Black elevator use decreased 15.7% (n=31) from baseline to treatment (see Table 8) (p> .05). Once the signs were removed elevator travel during the following week increased by 6% (n=14) (see Table 8) and was 3% (n=3) higher than week one of baseline data collection (p> .05).

Survey Data

Recall of intervention.

Of the 61 women surveyed 93.4% (n=57) reported being in the building at least two days a week (see Table 10). Of those women in the building at least two days a week 84.2% (n=38) had a positive recall of the sign intervention (see Table 11).

Overall, 42% (n=21) of the women surveyed, who recalled seeing the signs, properly listed at least two of the four sign locations, and 8% (n=4) of these women correctly remembered three of the four locations (see Table 11). Of the women recognizing multiple sign locations 90% (n=19), listed the point of choice, and/or signs above the elevator call buttons as at least one of the recollected sites. The two other sign locales (bathroom, water fountain) were recognized by 43% (n= 9) of the women listed multiple sign postings.

The most commonly remembered sign location, in women who were only recalled one sign placement, was above the elevator buttons (39.1%) (n=9). The point of choice sign on floors one, and three, and the sign in the bathrooms were recognized equally (26.1%, n=6) in women remembering only one location. The drinking fountain sign was recalled by 8.7% (n=2) of women identifying a lone sign site (see Table 11).

It should be noted 9.8% (n=6) of those who remembered seeing the signs gave incorrect locations when recalling sign placement. The most common areas mistakenly

listed were bulletin boards, and throughout the hallways. It is possible those who listed hallways as a location could have been referring to the sign positioned above the drinking fountain.

Reason for choosing the elevator over the stairs.

The two most common reasons given for choosing the elevator over the stairs was being lazy (28%, n=14), and too tired (26%, n=13) (see Table 12). Twenty six percent (n=13) of women gave alternate reasons other than the three choices given, or circled more than one reason for taking the elevator instead of the stairs (see Table 12). Other reasons presented included: Shoes ("worried about making a scene by falling up/down stairs"), take the stairs in other buildings, and choose to relax in this building, and only take the elevator when coming or going from a class on the third floor.

Effectiveness of sign in prompting choice of stairs over elevator.

Of the women who noticed the signs, and admitted they used the elevator sometimes, a lot, or always, 84.6% (n=22) said the signs did encourage them to choose the stairs over the elevator at least somewhat (see Table 13). Forty one percent (n=9) of this group claimed it was the reason for them choosing the stairs over the elevator.

Other factors motivating stair use.

Some common themes surfaced in the survey data concerning the final question regarding other factors women might find motivating enough to choose the stairs over the elevator. There were many positive comments regarding the signs themselves, and most of the suggestions were directly related to sign content. The majority of suggestions given have already proven effective through research. The most common suggestion was posting signs containing messages linking stair use with weight loss, and as a valid means

of exercise. The next most frequent idea presented was to use signs containing information on the health benefits associated with stair climbing. Other suggestions, which were not sign related, included making the stairwell more colorful, or aesthetically pleasing. Also suggested, was to have the Healthful Living teachers promote stair use during instruction, and provide information on the benefits of stair climbing.

Tables

Table 2: Total Observations Made During Baseline and Treatment

Phase	Elevator Observations	% Change
Baseline	n= 406	N/A
Treatment	n= 357	12.1%

Table 3: Elevator Travel During 1st Week of Baseline, 2nd Week of Treatment, & Follow-Up

Week	Elevator Observations	% Change From Baseline	% Change From Treatment
1st Week of Baseline	n= 215	N/A	N/A
2nd Week of Treatment	n= 160	-25.6%	N/A
Week of Follow-Up	n= 188	-12.6%	+17.5%

Table 4: Total Observations Made During Baseline and Treatment by Direction of Travel

Direction	Baseline	Treatment	% Change
Up	n= 257	n= 230	-10.5%
Down	n= 149	n= 127	-14.8%

Table 5: Elevator Travel by Direction at 1st Week of Baseline(B1), 2nd Week of Treatment (T2), & Follow-Up

Direction	B1	T2	Week of Follow- Up	% Change From B1 to T2	% Change From T2 to Follow- Up	% Change From B1 to Follow-Up
Up	n= 135	n= 80	n= 118	-40.7%	+47.5%	-12.6%
Down	n= 80	n= 58	n= 68	-27.5%	+17.2%	-15%

Table 6: Total Observations Made During Baseline and Treatment by Weight

Weight	Baseline	Treatment	% Change
Overweight	n= 241	n= 200	-17%
Not Overweight	n= 165	n= 157	-4.8%

Table 7: Elevator Travel by Weight At 1st Week of Baseline(B1), 2nd Week of Treatment (T2), & Follow-Up

Weight	B1	T2	Week of Follow-Up	% Change From B1 to T2	% Change From T2 to Follow-Up	% Change From B1 to Follow-Up
Overweight	n=122	n= 88	n= 113	-27.9%	+28.4%	-7.3%
Not Overweight	n= 93	n= 72	n= 75	-22.6%	+4.2	-19.4%

Table 8: Total Observations Made During Baseline and Treatment by Ethnicity

Ethnicity	Baseline	Treatment	% Change
White	n= 200	n= 186	-7%
Black	n= 198	n= 167	-15.7%

Table 9: Elevator Travel by Ethnicity at 1st Week of Baseline (B1), 2nd Week of Treatment (T2), & Follow-Up

Ethnicity	B1	T2	Week of Follow-Up	% Change From B1 to T2	% Change From T2 to Follow-Up	% Change From B1 to Follow-Up
White	n= 116	n=74	n= 82	-36.2%	+10.8%	-29.3%
Black	n= 97	n= 86	n= 100	-11.3%	+14%	+3%

Table 10: How Often in Building During Spring 2005 Semester

How Often in Building	Frequency	Percent
<1a month	3	4.9%
Once a week or <	1	1.6%
2-3 days/wk	30	49.2%
4-5 days/wk	27	44.3%
Total	61	100%

Table 11: Recall of Sign Prompts

How Often In Building	Yes	No
2-3 Days/Week	24	6
4-5 Days/Week	24	3

Table 12: Recall of Sign Locations

Location	Frequency	Percent
Elevator Button	9	18%
Point of Choice	6	12%
Bathroom	6	12%
Drinking Fountain	2	4%
Incorrect	6	12%
2 of 4	17	34%
3 of 4	4	8%
Total	50	100%

Table 13: Reasons For Using Elevator

Reason	Frequency	Percent
Being Lazy	14	28%
Too Tired	13	26%
Saves Time	10	20%
Other	9	18%
Tired & Time	3	6%
Tired, Time, & Lazy	1	2%
Total	50	100%

Table 14: Influence of Signs on Elevator Travelers

Influence	Frequency	Percent
Somewhat	13	52%
Yes	9	36%
No	3	12%
Total	25	100%

CHAPTER 4

Discussion, Conclusion, and Recommendations

Limitations

A major limiting factor of this study was lack of man power. The use of only one observer did not allow for observation of elevator travel between floors two and three, nor did it permit simultaneous observation of both elevator and stair travel. The inability to simultaneously observe stair and elevator use did not allow for the comparison of the change in percent of those taking the stairs versus the elevator throughout the three phases of data collection as most other research has done.

Further limiting research was the inability to control for population within the building during data collection periods. This is a limitation to this research due to the fact the building was chosen because it is a setting in which the likelihood of repeat travel is high, but not for certain.

Both these limitations were addressed somewhat by survey data collected. Although percent changes could not be compared between stair and elevator travel over 84% of the women surveyed who saw the signs, and used the elevator admitted the signs did encourage them to take the stairs instead of ride the elevator. The survey data also showed over 93% of the women were in the building two or more days per week. This is not to say attendance rates were absolute during observations but the probability of repeat travel can be assumed high (See Appendix A for research questions, limitations, delimitations, definitions, and assumptions).

Observational Data

The 12.1% decrease in elevator travel during the sign intervention, although not significant, did show a trend towards significance (p=.076). During follow-up observations elevator travel did rise by 16.9%, but was still more than 13% lower than the first week of baseline collection. This pattern is similar to other ABA point of choice studies where during the follow-up phase the percentage of those taking the elevator did increase from treatment travel levels but was still lower than baseline levels (Blamey et al., 1995; Brownell et al., 1980; Kerr et al., 2001d)

Although there was a trend towards significant decreases in elevator travel during the treatment phase, the lack of significance within this research is not surprising, even though not consistent with the majority other studies. Due to time constraints of the research limiting the duration of baseline, treatment, and the follow-up phases, coupled with the delimitation placed on the research by the PI to observe women only, and the limitation of available man power confining observation to elevator travel only, the total number of observations made within this study was much lower than other studies where observations where in the thousands (Faskunger et al., 2003; Russell et al., 1999; Russell and Hutchinson, 2000), tens of thousands(Blamey et al., 1995; Boutelle et al., 2001; Brownell et al., 1980; Kerr et al., 2001a; Kerr et al, 2001b; Kerr et al., 2001c; Kerr et al., 2001d), and in some cases hundreds of thousands (Coleman and Gonzalez, 2001; Marshall et al., 2002).

During the treatment phase the greatest decreases in elevator travel occurred in overweight woman, and black women, 17%, and 15.7% decreases respectively. The percent decrease in elevator travel in black women in this study during the treatment

phase can be further validated by the survey data obtained. Overall, 80.8% (n=21) of the black women surveyed reported seeing the motivational signs. Of those black females who saw the sign, and used the elevator at least sometimes 87.5% (n=14) said the sign prompts did motivated them, at least somewhat, to choose the stairs over the elevator, and 46.2% (n=6) said it was the direct reason why they decided to take the stairs over the elevator. In white woman, the prompt was reported effective in 80% (n=8) of those surveyed that were at least occasional elevator users.

This survey results concerning the effectiveness of the signs is of interest. In some research the quantitative data obtained during the treatment phase has often shown the signs to be more effective in reducing white elevator travel more so than their black counter parts (Andersen et al., 1995; Kerr et al., 2001b). In this research both the quantitative, and qualitative research seems to show the signs were equally effective in influencing black women and white women. Although similar patterns emerged across ethnicity in elevator travel during baseline, the treatment phase observational data showed a greater non-significant decrease in white elevator travel (15.7% vs. 7%).

Just as black and overweight women showed the greatest decreases during the treatment phase, they also were observed to have the greatest increases in elevator use once the signs were removed. During follow-up observations, elevator travel increased by 28.4% in overweight woman, and 16.3% in black woman when compared to the last week of treatment observations. Elevator use was 3% greater in black females when compared with the first week of baseline elevator use.

These increases are of interest. Unfortunately, no data were collected to determine the lasting motivating effects women might perceive the signs could have. Although

elevator travel increased across all categories during the weeklong follow-up phase it was still 13.5% (n=29) lower than the first week of baseline observations.

Similar to this research, the Boutelle et al. (2001) study reported no significant differences, nor trends in significance between baseline, and their sign only treatment. It is important to compare the Boutelle and co-workers study because many of the methods within this research are similar. Both took place within an academic building, and both placed signs in multiple locations within the building. There may be a number of reasons why neither significance, nor significant trend occurred within the Boutelle et al. research. The academic building in the Boutelle et al. study consisted of eight floors, and also required a key card to access the stairwell. The College of Education building at Georgia Southern University contains three floors of classrooms, and offices, and the main stairwell is easily accessible to all entering the lobby. No card swipe is required. People may find it much easier to choose to walk up two floors of stairs compared to 4-8 floors. Some may have found the card swipe to access the stairwell in the Boutelle et al. study a deterrent to stair use. Others may not have had a card to swipe. The data collectors took an informal survey and found one-third of those asked did not have a key to access the stairwell. Another possible variable is the number of signs used within each building. The Boutelle et al. research placed a sign at the point of choice, and above all elevator buttons. By adding signs to other high traffic areas, such as in this research, the exposure rate to the signs may have increased, and therefore could possibly influenced more people. It should be noted once music and artwork were added in the Boutelle et al. study significant differences did exist between stair, and elevator travel.

Survey Data

Over 84.2% of woman surveyed, who were regularly in the building, reported seeing the signs posted during the treatment phase. This is similar to the Kerr et al. (2001b) study done using stair rise banners to promote stair use over escalator travel in a mall (78.3%), and the Marshall et al. (2002) investigation using a sign by the elevator, and footprints to the stairwell in a health care facility (90%).

The survey data also showed there may be other high traffic areas within a building which may be beneficial to consider when attempting to decrease sedentary methods of travel through the posting of motivational signs. In woman who recalled only one sign location, the signs hung in the bathroom locations were as frequently remembered as the point of choice sign prompt on floors one and three. Although 90% (n=19) of the women who remembered multiple sign locations listed the point of choice sign, and/or the signs above the elevator buttons as at least one of the remembered sign locations, 45% (n=9) also had the sign in the bathrooms and/or above the drinking fountains as a recollected sign locality. These location areas may only be beneficial in buildings with a high probability of repeat travelers such as an office building, hospital, or academic building.

Some women reported although they already used the stairs within the data collection site the signs did motivate them to use the stairs over the elevator in other buildings. There were many positive comments regarding the signs themselves, and most of the suggestions given for the final question (Are the any other factors you think might motivate you or other women to choose the stairs over the elevator?) were directly related to sign content. The majority of suggestions given have already proven effective through

research. The 1995 study done by Andersen et al. comparing point of choice signs containing health messages verse signs containing weight loss slogans found both forms of signs to be equally effective. Another suggestions present by women surveyed were to use deterrent signs to decrease elevator travel. Russell and Hutchinson (2000) compared deterrent, and health signs and found both significantly decreased escalator use, but no significant differences existed between sign content and effectiveness. Research done within an office building, and academic building both showed adding artwork, and music to the stairwell to increase stair travel (Boutelle et al., 2001; Kerr et al., 2004).

Conclusion and Recommendations

This was a short-term study to determine if signs containing slogans encouraging stair use could decrease elevator travel in women. Although no statistical differences were found, a 12% decrease in elevator travel, coupled with the high recall of influence of the sign prompts seen in the survey data suggests a practical significance. For example, if 30% of the 2774 College of Education students were elevator users and during treatment there was a 12% decrease in elevator travel among all College of Education students this would produce 100 more students using the stairs than before the sign prompts were introduced.

Obesity, research has shown, takes away from one's quality of life (Fontaine & Barofsky, 2001), and reduces life expectancy (Fontaine, Redden, Wang, & Allison, 2003). Motivational signs used to decrease sedentary methods of travel are an easy, cost effective way any community setting can bring to light the opportunity for one to participate in moderate intensity activity, as well as promote an activity that has relatively

easy access, and simplicity of movement. Both of which address two key concepts included in *Health People 2010.*

The observational data showed the sign prompts seemed to have a greatest influence on both overweight, and black women. This is encouraging news and calls for similar research as this to be carried out using longer baseline, treatment, and follow-up observation phases, as well as simultaneous observation of both stair, and elevator use to determine if significant differences can be seen through the use of multiple sign locations in buildings that have a high probability for repeat travel.

Future studies within academic and offices buildings should also be done comparing the traditional single sign point of choice prompt treatment to the multi-sign placement strategy used in this research to see if significant differences exist between the two intervention strategies among both men and women of all body types, and ethnicities.

Reference List for Chapters 1-4

American College Health Association (2002). *Healthy Campus 2010: Making It Happen.* Baltimore, MD: American Health Association Task Force on National Health Objectives for 2010.

Andersen, R. E., Franckowiak, S. C., Snyder, J., Bartlett, S. J., & Fontaine, K. R. (1998). Can inexpensive signs encourage the use of stairs? Results from a community intervention. *Annals of Internal Medicine, 129*(5), 363-369.

Andersen, R. E., Franckowiak, K. B., & Zurak, E. S. (2000). Community intervention to encourage stair use among African American commuters. *Medicine and Science in Sports and Exercise, 32*(5), S38.

Blamey, A., Mutrie, N, & Aitchison, T. (1995). Health promotion by encouraged use of stairs. *British Medical Journal, 311*(28), 289-290.

Boutelle, K. N., Jeffery, R. W., Murray, D. M., & Schmitz, K. H. (2001). Using signs, artwork, and music to promote stair use in a public building [Electronic version]. *American Journal of Public Health, 91*(12), 2004-2006.

Brownell, K. D., Stunkard, A. J., & Albaum, J. M. (1980). Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry, 137*(12), 1540-1545.

Brownson, R. C., Baker, E. A., Housemann, R. A., Brennan, L. K., & Bacak, S. J. (2001). Environmental and policy determinants of physical activity in the United States [Electronic version]. *American Journal of Public Health, 91*(12), 1995-2003.

Center for Disease Control [CDC]. (2001a). *Guide to community preventive services: At a glance* [Online]. Available: http://www.thecommunityguide.org/default.htm [Retrieved April 3, 2005].

CDC (2001b). *Guide to community preventive services: Physical activity* [Online]. Available: http://www.thecommunityguide.org/default.htm [Retrieved April 3, 2005]

CDC (2001c). Increasing physical activity: A report on recommendations of the task force on community preventive service [Electronic version]. *Morbidity and Mortality Weekly Report,50*(RR18), 1-16.

Coleman, K. J., & Gonzalez, E. C. (2001). Promoting stair use in a U.S.-Mexico border community [Electronic version]. *American Journal of Health Promotion, 91*(12), 2007-2009.

Coupland, C., Cliffe, S. J., Bassey, E. J., Grainge, M. J., Hosking, D. J., & Chilvers, C. (1999). Habitual physical activity and bone mineral density in postmenopausal women in England. *International Journal of Epidemiology, 28,* 241-246.

Faskunger, J., Poortvliet, E., Nylund, K., & Rossen, J. (2003). Effect of an environment barrier to physical activity on commuter stair use [Electronic version]. *Scandinavian Journal of Nutrition, 47*(1), 26-28.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002) Prevalence and trends in obesity among U.S. adults, 1999-2000. *Journal of the American Medical Association, 288*(14), 1723-1727.

Fontaine, K. R., & Barofsky, I. (2001). Obesity and health-related quality of life [Electronic version]. *Obesity Reviews, 2*, 173-182.

Fontaine K. R., Redden, D. T., Wang, C., Westfall, A. O., & Allison, D. B. (2003).Years of life lost due to obesity [Electronic version]. *Journal of American Medical Association, 289*(2), 187-193.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., et al. (2002). The effectiveness of interventions to increase physical activity. *American Journal of Preventative Medicine, 22*(4), 73-108.

Kerr, J., Eves, F., & Carroll, D. (2001a). Encouraging stair use: Stair-riser banners are better than posters [Electronic version]. *American Journal of Public Health, 91*(8), 1192-1193.

Kerr, J., Eves, F. F., & Carroll, D. (2001b). Getting more people on the stairs: The impact of a new message format. *Journal of Health Psychology, 6*(5), 495-500.

Kerr, J., Eves, F. F., & Carroll, D. (2001c). The influence of poster prompts on stair use: The effects of setting, poster size and content [Electronic version]. *British Journal of Health Psychology, 6*(4), 397-405.

Kerr, J., Eves, F., Carroll, D. (2001d). Six-month observational study of prompted stair climbing. *Preventive Medicine, 33*(5), 422-427.

Kerr, N. A., Yore, M. M., Ham, S. A., & Dietz, W. H. (2004). Increasing stair use in a worksite through environmental changes [Electronic version]. *American Journal of Health Promotion, 18*(4), 312-315.

Marshall, A. L., Bauman, A. E., Patch, C., Wilson, J., & Chen, J. (2002). Can motivational signs prompt increases in incidental physical activity in an Australian health-care facility? *Health Education Research, 17*(6), 743-749.

Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *Journal of the American Medical Association, 286*(10), 1195-1200.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., et al. (1995). Physical activity and public health. *Journal of the American Medical Association, 273*(5), 402-407.

Russell, W. D., Dzewaltowski, & Ryan, G. J. (1999). The effectiveness of a point-of-decision prompt in deterring sedentary behavior [Electronic version]. *American Journal of Health Promotion, 13*(5), 257-259.

Russell, W. D., & Hutchinson, J. (2000). Comparison of health promotion and deterrent prompts in increasing use of stairs over escalators. *Perceptual and Motor Skills, 91*(1), 55-61.

United States Department of Health and Human Services (2000). *Healthy People 2010: Understanding and Improving Health, Volume I and II, Second Edition.* Washington, D.C.: U.S. Government Printing Office.

United States Department of Health and Human Services (n.d.) *Overweight and obesity: What you can do.* Retrieved January 25, 2005, from http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_whatyoucando.htm

APPENDICIES

Appendix A: Research Questions, Limitations, Delimitations, Assumptions, and Definitions

Research Questions

1. Can elevator use be decreased in women through the placement of motivational signs encouraging stair use?
2. Once signs are removed will there be significant differences between baseline and follow-up elevator travel?
3. Once signs are removed will there be significant differences between treatment and follow up elevator travel?
4. Will there be an association between ethnicity and elevator use?
5. Will there be an association between body weight and elevator use?
6. What reasons do women choose to use the elevator?
7. How recognizable were the signs during the treatment phase?
8. Are there any sign locations more recognizable than others?
9. What motivational techniques do women feel could promote choosing the stairs over the elevator?

Limitations

-Survey data collected does not use a random sample.

-Cannot control for the number of people within the building during a given time.

-Cannot control the exposure rate of individuals to the signs.

-Man power to observe elevator travelers moving to and from floors two and three, as well as stair travel.

Delimitations

-Data will only be collected on women.

-Data collection site will consist of one academic building on Georgia Southern University.

Assumptions

-Because it is an academic building that has a class schedule that does not change throughout the semester most of the people traveling within the building are repeat travelers.

-Temperature inside the building is constant.

Definition

-Elevator traveler: Any woman carrying a heavy load, items larger than a purse, briefcase, or backpack accompanied by children, or physically handicapped will not be counted as an elevator traveler.

-Physically Handicapped: Any female who uses any assistance with travel (crutches, cane, walker, wheelchair, boot, etc.).

-Race classification: White, black, and other

Overweight: Subjective observational measures were used to categorize weight. The second observer was instructed by the primary investigator to view the midsection region of females and make an observational judgment on the presence of excess adipose. If the observer felt the clothes were too baggy to make an accurate judgment, or if the observer felt the woman was borderline he was instructed to classify the woman as not overweight.

Point of Choice Prompt: “Signs placed by elevators and escalators to motivate people to use nearby stairs.” (p.77) (Kahn et al., 2002)

Appendix B: Review of Literature

Prevalence of Obesity in America

Healthy weight has long been an issue of concern in America. As far back as 1960 50% of men, and more than 40% of women were reported as overweight (Body Mass Index [BMI] $\geq$ 25), with 11% of males and 16% of females classified as obese (BMI > 30) (Flegal, Carroll, Ogden, & Johnson, 2002). From 1960 to 1980 obesity rates remained constant between both sexes rising about 1.6% over the 20-year period (Flegal et al., 2002).

After 1980 the prevalence of obesity skyrocketed. In 1980 the National Health and Nutrition Examination Survey (NHANES) reported the national obesity rate at 15%. By the year 2000 obesity levels jumped to 30.9% among males and females ages 20-74 (Flegal et al., 2002).

A study done by Mokdad et al. (2001) which collected height and weight data by phone survey to determine BMI, showed a 61% increase in obesity levels between 1991 and 2000.

Obesity Levels Among Women

Obesity trends in women closely mimicked that of males between 1960-1980 rising about 2% in 20 years (Flegal et al., 2002). From 1980 to 2000 female obesity levels increased from 17% to 34% (Flegal et al). Of the estimated 64.5 million women classified as overweight over half (54%) can be categorized as obese (National Institute of Diabetes & Digestive & Kidney Diseases [NIDDK], 2004). Women have also proven to have higher levels of extreme obesity (BMI $\geq$ 40) than men (Flegal et al.).

Obesity Levels in Black and Hispanic Females

Perhaps the most alarming trends in obesity occur within the female minority community. It is estimated that 77.3% of Non-Hispanic black women, and 71.9% of Mexican American women are overweight (Flegal et al., 2002; NIDDK, 2004). Between 1994 and 2000 levels of obesity in Non-Hispanic black women have risen 11.5% (Flegal et al.). This is by far the greatest increase in obesity levels among any sex/ethnic group. The NHANES data colleted between 1999 and 2000 shows nearly half (49.7%) of all Non-Hispanic black women are obese (Flegal et al.). Extreme obesity levels are on the rise in minority women as well. From 1994 to 2000 the prevalence of extreme obesity in Non-Hispanic black women increased from 7.2% to 15.1% (Flegal et al.). This is an increase more than quadruple what any other gender/ethnicity group experienced (Flegal et al.).

Obesity and Diabetes

Obesity has been linked as a risk factor for the acquisition of Type 2 diabetes (Ford, Willamson & Liu, 1997). It is estimated, in the United States, 70% of the risk for acquiring diabetes can be linked to excess weight (NIDDK, 2004). It has been reported Americans with a BMI of $\geq$ 29 are 27.6 times more likely to acquire Type 2 diabetes than those citizens who fall within healthy BMI ranges (BMI= 20-25) (Wolf, & Colditz, 1998). The Center for Disease Control (CDC) Diabetes Surveillance System reported in 2002, 79.5% of adults with diabetes were overweight, and 48.3% of diabetic adults were obese (CDC, 2004a). The study done by Ford et al. (1997) suggested for every one-kilogram (kg) increase in body weight the risk for acquiring diabetes increased by 4.5%. Other studies have shown as high as a nine percent increase in risk for every one

kilogram of increased weight (Mokdad et al., 2001). Research has indicated overweight Americans who lose small amounts of weight over a period of time can reduce the risk of acquiring diabetes. Resnick, Valsania, Halter, and Lin (2000) reported individuals who lost at least 10kg over a 10-year period reduced their risk of acquiring diabetes over the next 10 years by 33%.

Obesity and Quality of Life

Obesity puts an individual at risk for a myriad of diseases. It is debated if obesity itself is a disease. Regardless of its classification obesity does have a direct effect on quality of life and mortality.

A total of 39.3 billon workdays are lost each year as a direct result of complications associated with a BMI of $\geq$ 30 (Wolf, & Colditz, 1998). The number of obesity related disability claims received by MetLife insurance in 2003 more than doubled the number of claims received in 2001 (Leopold, 2004). It is estimated individuals who files obesity related short-term disability claims miss an average of 45 days of work per claim (Leopold).

Fontaine and Barofsky (2001) reported a meta-analysis of research on the impact obesity has on health related quality of life (HRQL). The two major effects they found were feelings of reduced energy and the presence of chronic pain. Fifty six percent of obese patients reported experiencing some form of chronic pain (Fontaine, & Barofsky,). Pain in the lower back and joints were the two most reported locations of discomfort (Fontaine, & Barofsky). Pain levels reported by obese adults were higher than pain levels reported in HIV, and congestive heart failure patients (Fontaine, & Barofsky). Pain levels were comparable to those reported by individuals who suffer from chronic migraine

headaches (Fontaine, & Barofsky). Overall obesity was associated with a significant decrease in HRQL. The review of research showed a strong positive correlation between BMI levels and score on The Medical Outcomes Study Short-Form Health Survey (SF-36) used to measure HQRL (Fontaine, & Barofsky).

Their analysis also reviewed research done on obese persons who lost weight and the effect the weight loss had on HQRL (Fontaine & Barofsky, 2001). One study reported a significant increase in seven of the eight HRQL domains on the SF-36 after a 12-week treatment involving lifestyle modifications consisting of diet changes, exercise, and group seminars on healthy behavior choices (Fontaine & Barofsky). Other research in which obese patients underwent various weight reduction surgeries reported increased levels of physical function, self-esteem, and social interaction (Fontaine, & Barofsky). These increases in HQRL remained significant after follow up periods of one year or more in the majority of studies (Fontaine, & Barofsky).

Obesity and Mortality

Studies have shown obese individuals have anywhere from a 50-100% increase in risk of death when compared with those who fall within normal BMI levels (NIDDK, 2004). In the year 2000, the second leading non-genetic modifiable cause of death (a.k.a. actual cause of death) to U.S. citizens was poor diet and physical inactivity (Mokdad, Marks, Stroup, & Gerberding, 2004). Second only to tobacco, yearly deaths from poor diet and inactivity increased 33% from 1990 to 2000 (Mokdad et al., 2004). This was the largest increase among all actual causes of death (Mokdad et al.). The number of annual deaths attributable to obesity among U.S. adults over 18 is estimated to be 280,000 (Allison, Fontaine, Manson, Stevens, & Van Itallie, 1999).

It is estimated 90,000 deaths a year from all forms of cancer could be prevented in the United States (U.S.) if BMI levels could be maintained within the healthy range among men and women (Calle, Rodriguez, Walker-Thurmond, & Thun, 2003). Obese men and women have cancer death rates 52% and 62% higher, respectively, than those of men and women who fall within normal BMI levels (Calle et al., 2003).

There is a high risk of mortality associated with a BMI between 30-39.9 among males for a variety of cancers. Among those cancers with a relative risk of 1.27 or higher are liver (RR=3.21), gallbladder (RR=1.76), colorectal (RR=1.66), stomach (RR=1.57), kidney (RR=1.53), pancreatic (RR=1.45), esophageal (RR=1.45), and prostate (RR=1.27) (Calle et al., 2003).

In women the same high risk for death caused by cancer exists for those with a BMI between 30-39.9. Those cancers include corpus and uterus (RR=2.65), cervical (RR=2.21), gallbladder (RR=2.13), kidney (RR=1.68), breast (RR=1.67), liver (RR=1.54), esophageal (RR=1.39), bladder (RR=1.34), ovarian (RR=1.34), pancreatic (RR=1.34), and colorectal (RR=1.34) (Calle et al., 2003).

It is estimated a 9-13 year decrease in life expectancy can be attributed to a BMI of 35 or greater in men and women (Fontaine, Redden, Wang, Westfall, & Allison, 2003). Among white men ages 20-30 with a BMI of 45 or greater a projected 13 years of life are lost as a direct result of extreme obesity (Fontaine et al., 2003). This is a 22% reduction in remaining life years assuming a life expectancy of 78 years (Fontaine et al., 2003). Among white women with BMI >45 eight years of life are lost due to obesity (Fontaine et al.). Among the black population men aged 20, with a BMI over 45 have a

life expectancy reduction of 20 years (Fontaine et al.). This is a 40% decrease in remaining life years using a life expectancy of 70 years (Fontaine et al.).

Economic Cost of Obesity

According to the most current study found on the economic cost of obesity Finkelstien, Fiebelkorn, and Wang (2003) estimated the total U.S. medical cost in 1998 attributable to overweight and obesity to be $78.5 billion (92.6 billion in 2002 dollars). The National Institute of Diabetes and Digestive and Kidney Diseases data on the economic cost of overweight and obese Americans posted in July of 2003, states $117 billion is spent annually on health care related to obesity.

Obesity costs U.S companies an average of $13 billon each year in medical expenses and lost productivity (Leopold, 2004). Out of pocket spending on obesity related health care rose 26.1% from 1996-1998 (Finkelstein et al., 2003). Annually, the average spending an obese American pays from his/her own funds on medical treatment is $294 (Finkelstein et al.). Government provided health care such as Medicaid, and Medicare spend an annual average of $2,284, and $3,836 respectively on each obese person receiving aid (Finkelstein et al.).

Trends in Physical Activity and Caloric Intake

The CDC's recommendation for weight control consists of a reduction in caloric intake, and an increase in physical activity (CDC, 2004c). A 2001 study done by Mokdad et al. reported 74.4% of all adults were trying to maintain or lose weight. Among this weight conscious group only 17.5% were using the fore-mentioned weight control strategies suggested by the CDC (Mokdad et al). Focusing on data obtained from those with a BMI $\geq$ 30, 86.5% reported currently attempting to maintain or lose weight

(Mokdad et al.). Although the majority of adults classified as obese stated they were attempting some form of weight management 63.7% of this same group also reported being completely physically inactive or not participating in activity on a regular basis (Mokdad et al.).

Along with low levels of physical activity caloric intake has been on the rise over the past decade. Average caloric intake for males between 1976-1980 was 2,439 calories (Kcals) per day (CDC, 2004b). Between 1999-2000 male caloric intake averaged 2,618 Kcals a day (CDC, 2004b). This is an increase of 179 Kcals a day. For females over the same periods of time caloric intake rose from 1,522 between 1976-1980 to 1,877 Kcals per day between 1999-2000 (CDC, 2004b). This translates into 355 more Kcals per day. Both these increase are statistically significant (CDC, 2004b).

Physical Activity Interventions

In general women, more than men, report having less accessibility to areas conducive for physical activity (Brownson, Ross, Baker, Housemann, Brennan, & Bacak, 2001). Overall the top three personal barriers women reported which prevent them from participating in physical activity on a regular basis are lack of time, lack of energy, and self consciousness (Brownson et al., 2001).

Through extensive reviews of 253 studies regarding physical activity interventions the CDC developed the “Community Guide” (CDC, 2001). The “Community Guide” consists of six physical activity intervention recommendations broken up into three approach categories (CDC, 2001; Kahn et al., 2002).

Behavioral and social approach.

"The behavioral and social approaches focus on increasing physical activity by teaching applicable behavior management skills and by structuring the social environment to provide support for people trying to initiate or maintain behavior change" (p. 80) (Kahn et al., 2002). There were six types of interventions reviewed in this category (Kahn et al.). Of the six, three were found to be effective: school-based physical education, family based social support, and individually adapted health behavior changes (CDC, 2001; Kahn et al.).

Environmental and policy approach.

"Environmental and policy approaches are designed to provide environmental support and cues to help people develop healthier behaviors" (p.87) (Kahn et al., 2002). The most effective environmental and policy interventions enhanced ease of access to places for physical activity combined with an informational campaign (CDC, 2001). Two other forms of environmental physical activity interventions studies were underway at the time of this review of literature but no data or conclusions were provided. The research is focusing on transportation and infrastructure changes, as well as zoning and land use in urban areas to encourage non-motorized transportation (Kahn et al.).

Informational approach.

"Informational approaches are designed to increase physical activity by providing information necessary to motivate and enable people to change their behavior over time as well as to maintain that change over time" (p.76) (Kahn et al., 2002). Four forms of information interventions were reviewed (Kahn et al.). Of the four, two were

recommended: community wide campaigns using a multitude of intervention strategies, and point of choice decision prompts to encourage stair use (CDC, 2001; Kahn et al.).

Point of Choice Studies

Method of environmental change.

Researchers have incorporated a variety of strategies in attempts to discover effective methods of encouraging stair travel over elevator or escalator use. Faskunger, Poorvliet, Nylund, and Rossen (2003) controlled the number of escalators running during pedestrian morning rush hour traffic in a train station. This proved effective as stair use increased by almost 50% with the presence of only one ascending escalators (Faskunger et al., 2003).

The integration of motivational banners positioned on alternate stair risers of a staircase has successfully increased stair travel (Kerr, Eves, & Carroll, 2001a; Kerr, Eves, & Carroll, 2001b; Kerr, Eves, Carroll, 2001d). Also, point of choice deterrent signs asking for elevator use to be limited to staff or the physically disabled has shown to increase stair use (Russell, Dzewaltowski, & Ryan, 1999; Russell, & Hutchinson, 2000).

The majority of environmental manipulation studies at a point of choice location have used motivational signs encouraging stair use (Andersen, Franckowiak, Snyder, Bartlett, & Fontaine, 1998; Andersen, Franckowiak, Zurak, & Cummings, 2000; Blamey, Mutrie, & Aitchison, 1995; Boutelle, Jeffery, Murray, & Schmitz, 2001; Brownell, Stunkard, & Albaum, 1980; Coleman, & Gonzalez, 2001; Kerr, Eves, & Carroll, 2001c; Kerr, Yore, Ham, Dietz, 2004; Marshall, Bauman, Patch, Wilson, & Chen, 2002). Sign content usually consists of a health or weight related motivational saying sometimes accompanied by a picture. Also, motivational signs coupled with efforts to make the

stairwell more aesthetically pleasing through artwork and music has proven helpful. (Boutelle et al., 2001; Kerr et al., 2004).

Setting.

A wide variety of locations have been used as data collection sites. The most common setting of choice is shopping centers (Andersen et al., 1998; Brownell et al., 1980; Kerr et al., 2001a; Kerr et al., 2001b; Kerr et al., 2001c) The second most common observational site were structures associated with commuter, and/or leisure travel such as train stations, bus stations, and airports (Andersen et al.; Brownell et al.; Coleman & Gonzalez; Faskunger et al.; Russell & Hutchinson).

There were three studies done which used a college campus building as a data collection setting (Boutelle et al., 2001; Coleman & Gonzalez, 2001; Russell et al., 1999). Two of which used the campus library as the setting of choice (Coleman & Gonzalez; Russell et al.). The other used an academic classroom building (Boutelle et al.).

Data Collection Procedures

Observations.

The majority of data collection was done using human observations (Andersen et al., 1998; Andersen et al., 2000; Blamey et al., 1995; Boutelle et al., 2001; Brownell et al., 1980; Coleman and Gonzalez, 2001; Faskunger et al., 2003; Kerr et al., 2001a; Kerr et al., 2001b; Kerr et al., 2001c; Kerr et al., 2001d; Russell et al., 1999; Russell and Hutchinson, 2000). Many collection procedures used multiple observers to count pedestrian traffic to ensure reliability (Blamey et al.; Boutelle et al.; Brownell et al.; Coleman and Gonzalez; Kerr et al., 2001b; Kerr et al., 2001c; Russell and Hutchinson). Others used a single observer (Andersen et al.; Kerr et al 2001a; Kerr et al., 2001d;

Russell et al.). Andersen et al., validated the use of a single observer to collect data stating, “The volume of mall traffic was never so heavy more than one observer was needed to code the characteristics and choice of each person” (p.364). Other research, which used a single observer to collect data, incorporated unannounced spot checks where the author along with the observer collected data together to ensure reliability (Russel et al.). Pilot testing and training of the observers was also used to ensure observations were as accurate as possible (Andersen et al.; Russell et al.).

Classification of travelers.

All research classified activity of the traveler. It is important to note the Boutelle et al. (2001), counted travelers both entering and exiting the stairwell and elevator. Many of the researchers further classified travelers by age, and sex (Andersen et al., 1998; Blamey et al., 1995; Brownell et al., 1980; Kerr et al., 2001c; Kerr et al., 2001d; Russell et al., 1999; Russell and Hutchinson, 2000). Ethnicity of pedestrians was documented in four studies (Andersen et al., 1998; Andersen et al., 2000; Brownell et al., Kerr et al., 2001d), and weight in two (Andersen et al., 1998; Brownell et al., 1980). The Brownell et al. (1980), study used obese and non-obese as its method of classification. Andersen et al. (1998) used the terms overweight and not overweight for classification. None of the research that used such classifications as age, sex, ethnicity, or weight used objective means for classification. All were made by observer judgment.

Some research did provide some form of exclusion criteria which limited exactly who could be classified as an elevator traveler (Boutelle et al., 2001; Russell et al., 1999; Russell and Hutchinson, 2000). Elevator travelers were not counted if they were carrying items larger than a briefcase, or pushing a cart in the Boutelle et al. study. Russell et al.,

and Russell and Hutchinson further defined exclusion criteria to include the physically challenged, as well as any traveler accompanied by children. Other research coded and/or marked if an elevator/escalator traveler was carrying a large item and/or accompanied by children (Coleman and Gonzalez, 2001 Kerr et al., 2001b, Kerr et al., 2001c, Kerr et al., 2001d,).

Survey data.

The only research located collecting some form of post treatment survey data was the Marshall et al. (2002) study. Forty staff members from the observation site (Australian Health Care facility) were asked about intervention recall, perceived stair use, and reasons using the elevator.

Outcome of Motivational Sign Interventions

Most of the research conducted using point of choice motivational signs has proven successful (Andersen et al., 1998; Andersen et al., 2000; Blamey et al., 1995; Brownell et al., 1980; Marshall et al., 2002; Russell et al., 1999). The multi-site intervention done by Coleman, and Gonzalez (2001) was met with mixed results. Two out of the three observation sites experienced significant increases in stair travel during the one-month treatment phase. The other site, the University of Texas El-Paso campus library, had significant decreases in stair use among men during the intervention phase and no difference in female stair travel during the same period (Coleman, & Gonzalez,).

The Boutelle et al. study (2001) found no significant difference in stair use during the presence of a motivational sign. When the signs were coupled with stairwell artwork, and music stair travel did increase significantly in the University of Minnesota School of Public Health building (Boutelle et al.).

Effectiveness of Point of Choice Signs on Females

Research has shown mixed results of treatment effectiveness on the female population. During the three-month intervention period by Andersen et al. (1998) there were significant increases among both males and females in stair use. When compared between sexes stair travel patterns were also found to be similar (Andersen et al., 1998). Other research has successfully increased stair use in women, but when compared to men stair travel by women remained significantly lower at both the baseline and treatment phase (Brownell et al., 1980; Blamey et al., 1995).

In the research done by Brownell et al. (1980) post treatment data collection showed female stair travel returned to pre-intervention levels significantly faster than males. No change was found in female stair use when a sign deterring elevator use was placed in a library on the campus of Kansas State University (Russell et al., 1999).

Effectiveness of Point of Choice Signs on Ethnicities

In three studies located comparing stair travel among ethnicities two out of the three proved to be as effective in both black and white persons (Andersen et al., 1998; Andersen et al., 2000; Brownell et al., 1980). Both the Andersen et al. (1998) study, and first part of the Brownell et al. research showed no differences in baseline stair travel among ethnicities. Once the intervention began both studies saw a significantly higher portion of white stair travelers (Andersen et al, 1998; Brownell et al.). Blacks did significantly increase stair travel in both parts of the Brownell et al. investigation. No increases in stair travel were seen in minorities throughout two different treatment phases administered by Andersen et al. (1998) in a shopping mall.

As previously stated the second part of the 1980 research by Brownell et al. did elicit significant increases in black stair travel. The increases of this study were of an equal magnitude when compared between ethnicities (Brownell et al., 1980). Although the 1998 research by Andersen et al. was not successful in facilitating stair use in black shoppers a 2000 study done by Andersen et al. specifically targeting black commuters was a success. The intervention sign used in this research consisted of a motivational statement and a picture of an black women walking up a flight of stairs (Andersen et al., 2000). This sign treatment proved to successfully increase stair travel among all ethnicities (Andersen et al., 2000).

Effectiveness of Point of Choice Signs on Weight

Only two research studies were located in which travelers were classified by weight. The Andersen et al. (1998) research classified people as overweight or not overweight. “Before the study began, the observer and the senior author spent one full day in the mall classifying shoppers by age and weight status to be sure observations were as accurate as possible” (p.364) (Andersen et al.). Significant increases in stair use were seen in persons overweight and not overweight (Andersen et al.). The presence of a weight control sign was also found to significantly increase stair travel in people coded as overweight when compared to a treatment using a health related sign content (Andersen et al.).

The ABA Brownell et al. (1980) research design coded travelers as obese or nonobese. No significant increases in stair travel were found among obese persons (Brownell et al.). Significant increases did occur during the treatment in travelers labeled

nonobese (Brownell et al.). Nonobese people used the stairs significantly more than obese during all phases of data collection (Brownell et al.)

Appendix B Reference List

* References marked with an asterisk indicate studies included in the meta-analysis.

Allison, D. B., Fontaine, K. R., Manson, J. E., Stevens, J., & VanItallie, T. B. (1999). Annual deaths attributable to obesity in the United States. *Journal of the American Medical Association, 282*(16), 1530-1538.

Andersen, R. E., Franckowiak, S. C., Snyder, J., Bartlett, S. J., & Fontaine, K. R. (1998) Can inexpensive signs encourage the use of stairs? Results from a community intervention. *Annals of Internal Medicine, 129*(5), 363-369.

Andersen, R. E., Franckowiak, K. B., & Zurak, E. S. (2000). Community intervention to encourage stair use among African American commuters. *Medicine and Science in Sports and Exercise, 32*(5), S38.

Blamey, A., Mutrie, N, & Aitchison, T. (1995). Health promotion by encouraged use of stairs. *British Medical Journal, 311*(28), 289-290.

Boutelle, K. N., Jeffery, R. W., Murray, D. M., & Schmitz, K. H. (2001). Using signs, artwork, and music to promote stair use in a public building [Electronic version]. *American Journal of Public Health, 91*(12), 2004-2006.

Brownell, K. D., Stunkard, A. J., & Albaum, J. M. (1980). Evaluation and modification of exercise patterns in the natural environment. *American Journal of Psychiatry, 137*(12), 1540-1545.

Brownson, R. C., Baker, E. A., Housemann, R. A., Brennan, L. K., & Bacak, S. J. (2001). Environmental and policy determinants of physical activity in the United States [Electronic version]. *American Journal of Public Health, 91*(12), 1995-2003.

Calle, E. E., Rodriguez, C., Walker-Thurmond, K., & Thun, M. J. (2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *The New England Journal of Medicine, 348*(17), 1625-1638.

Center for Disease Control [CDC]. (2001). Increasing physical activity: A report on recommendations of the task force on community preventive service [Electronic version]. *Morbidity and Mortality Weekly Report,50*(RR18), 1-16.

CDC. (2004a). *Data and trends: Diabetes Surveillance System.* Retrieved November 14, 2004, from http://www.cdc.gov/diabetes/statistics/comp/table7.htm

CDC. (2004b). Trends in intake of energy and macronutrients-United States, 1971-2000 [Electronic version]. *Morbidity and Mortality Weekly Report, 53*(04), 80-82.

CDC. (2004c). *Nutrition and physical activity: General recommendations*. Retrieved December 14, 2004, from http://www.cdc.gov/nccdphp/dnpa/physical/recommendation

Coleman, K. J., & Gonzalez, E. C. (2001). Promoting stair use in a U.S.-Mexico border Community [Electronic version]. *American Journal of Health Promotion, 91*(12), 2007-2009.

*Choban, P. S., Onyejekwe, J., Burge, J. C., & Flancbaum, L. (1999). A health status assessment of impact of weight loss following rouxen-en-y gastric bypass for clinically severe obesity. *Journal of the American College of Surgeons, 188*, 491-497.

*Dano, P., & Hahn-Pedersen, J. (1977). Improvement in quality of life following jejunoileal bypass surgery for obesity. *Scandinavian Journal of Gastroenterology, 12*, 769-744.

*Doll, H. A., Petersen, S. E., & Stewart-Brown, S. L. (2000). Obesity and physical and emotional well being: Associations between body mass index, chronic illness, and the physical and mental components of the sf-36 questionnaire. *Obesity Research, 8,* 160-170.

Faskunger, J., Poortvliet, E., Nylund, K., & Rossen, J. (2003). Effect of an environment barrier to physical activity on commuter stair use [Electronic version]. *Scandinavian Journal of Nutrition, 47*(1), 26-28.

*Fine, J. T., Colditz, G. A., Coackley, E. H., et al. (1999). A prospective study of weight change and health-related quality of life in women. *Journal of the American Medical Association, 282,* 2136-2142.

*Finkelstien, M. F. (2000). Body mass index and quality of life in a survey of primary care patients. *Journal of Family Practitioners, 49,* 734-737.

Finkelstien, E. A., Flebelkorn, I. C., & Wang, G. (2003). National medical spending attributable to overweight and obesity: How much, and who's paying? *Health Affairs, web exclusive*. Retrieved September, 2004, from http://content.healthaffairs.org/cgi/content/full/hlthaff.w3.219v1/DC1?maxtoshow=&HITS=10&hits+10RESULTFORMAT=&author1=finkelstein&fulltext=medical+spending+and+obesity&andorexactfulltext=and&searxhid=1102973628377_3669&stored_searched=&FIRSTINDEX=0&resourcetype=1&journalcode=healthaff

*Fontaine, K. R., Bartlett, S. J., & Barofsky, I. (2000). Health-related quality of life among obese persons seeking and not seeking treatment. *International Journal of Eating Disorders, 27,* 101-105.

*Fontaine, K. R., Barofsky, I., & Andersen, R. E., et al. (1999). Impact of weight loss and pain and health-related quality of life. *Quality of Life Research, 8,* 275-277.

Fontaine, K. R., & Barofsky, I. (2001). Obesity and health-related quality of life [Electronic version]. *Obesity Reviews, 2,* 173-182.

Fontaine K. R., Redden, D. T., Wang, C., Westfall, A. O., & Allison, D. B. Years of life lost due to obesity [Electronic version]. *Journal of American Medical Association, 289*(2), 187-193.

Ford, E. S., Willamson, D. F., & Liu, S. (1997). Weight change and diabetes incidence: Findings from a national cohort of U.S. adults. *American Journal of Epidemiology, 146*(3), 214-222.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002) Prevalence and trends in obesity among U.S. adults, 1999-2000. *Journal of the American Medical Association, 288*(14), 1723-1727.

*Hafner, R. J., Watts, J. M., & Rogers, J. (1991). Quality of life after gastric bypass surgery for morbid obesity. *International Journal of Obesity, 15*, 555-560.

*Isacsson, A., Frederiksen, S. G., Nilsson, G., et al. (1997). Quality of life after gastroplasty is normal: A controlled study. *European Journal of Surgery, 163*, 181-186.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., et al. (2002). The effectiveness of interventions to increase physical activity. *American Journal of Preventative Medicine, 22*(4), 73-108.

*Karlsson, J., Sjostrom, L., & Sullivan, M. (1998). Swedish obese subjects-An intervention study of obesity. Two-year follow-up of health-related quality of life and eating behavior after gastric surgery for severe obesity. *Journal of Obesity Related Metabolic Disorders, 22*, 113-126.

Kerr, J., Eves, F., & Carroll, D. (2001a). Encouraging stair use: Stair-riser banners are better than posters [Electronic version]. *American Journal of Public Health, 91*(8), 1192-1193.

Kerr, J., Eves, F. F., & Carroll, D. (2001b). Getting more people on the stairs: The impact of a new message format. *Journal of Health Psychology, 6*(5), 495-500.

Kerr, J., Eves, F. F., & Carroll, D. (2001c). The influence of poster prompts on stair use: The effects of setting, poster size and content [Electronic version]. *British Journal of Health Psychology, 6*(4), 397-405.

Kerr, J., Eves, F., Carroll, D. (2001d). Six-month observational study of prompted stair climbing. *Preventive Medicine, 33*(5), 422-427.

Kerr, N. A., Yore, M. M., Ham, S. A., & Dietz, W. H. (2004). Increasing stair use in a worksite through environmental changes [Electronic version]. *American Journal of Health Promotion, 18*(4), 312-315.

*Kral, J. G., Sjostrom, L. V., & Sullivan, M. B. (1992). Assessment of quality of life before and after surgery for severe obesity. *American Journal of Clinical Nutrition, 55*, 611-614.

*Larsen, F. (1990). Psychosocial function before and after gastric banding surgery for morbid obesity: A prospective psychiatric study. *Acta Psychiatrica Scandinavica, 359*, 1-57.

*Lean, M. E., Han, T. S., Seidell, J. C. (1999). Impairment of health and quality of life using new U.S. federal guidelines for the identification of obesity. *Archives of Internal Medicine, 159*, 837-843.

Leopold, R. S. (2004). Reining in the rising cost of health care. *Managed Healthcare Executive, 22*. Retrieved December 10, 2004, from http://www.managedhealthcareexecutive.com/mhe/article/articleDetail.jsp?id=134273

*LePen, C., Levy, E., Loos, F., Banzet, M. N., & Basdevant, A. (1998). 'Specific' scale compared with 'generic' scale: A double measurement of the quality of life in a French community sample of obese subjects. *Journal of Epidemiology and Community Health, 52*, 445-450.

*Mannucci, E., Ricca, V., Barciulli, E., et al. (1999). Quality of life and overweight: The obesity related well-being (Orwell 97) questionnaire. *Addictive Behaviors, 24*, 345-357.

*Marchesini, G., Solaroli, E., Baraldi, L., et al. (2000). Health –related quality of life in obesity: The role of eating behaviour. *Diabetes Nutrition and Metabolism, 13*, 156-164.

Marshall, A. L., Bauman, A. E., Patch, C., Wilson, J., & Chen, J. (2002). Can motivational signs prompt increases in incidental physical activity in an Australian health-care facility. *Health Education Research, 17*(6), 743-749.

*Mathias, S. D., Willamson, C. L., Colwell, H. H., et al. (1997). Assessing health-related quality of life and health state preference in persons with obesity: A validation study. *Quality of Life Research, 6*, 311-322.

Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *Journal of the American Medical Association, 286*(10), 1195-1200.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000. *Journal of the American Medical Association, 291*(10), 1238-1244.

*Mustajoki, P., Lempinen, M., Huikuri, K., et al. (1984). Long-tern outcome after jejunoileal bypass for morbid obesity. *International Journal of Obesity, 8,* 319-325.

National Institute of Diabetes and Digestive and Kidney Diseases. (2003). *Statistics related to overweight and obesity*. Retrieved August 19, 2004, from http://www.niddk.nih.gov/health/nutrit/pubs/statobed.htm

*Randomised trial of jejunoileal bypass versus medical treatment in morbid obesity. (1979). *Lancet, 2,* 1255-1258.

Resnick, H. E., Valsania, P, Halter, J. B., & Lin, X. (2000). Relation of weight gain and weight loss on subsequent diabetes risk in overweight adults [Electronic version]. *Journal of Epidemiology and Community Health, 54*(8), 596-602.

Russell, W. D., Dzewaltowski, & Ryan, G. J. (1999). The effectiveness of a point-of-decision prompt in deterring sedentary behavior [Electronic version]. *American Journal of Health Promotion, 13*(5), 257-259.

Russell, W. D., & Hutchinson, J. (2000). Comparison of health promotion and deterrent prompts in increasing use of stairs over escalators. *Perceptual and Motor Skills, 91*(1), 55-61.

*Van Gemert, W. G., Adang, E. M., Kop, M., Vos, G., Greve, J. W., & Soeters, P. B. (1999). A prospective cost-effective analysis of vertical banded gastroplasty for the treatment of morbid obesity. *Obesity Surgery, 9,* 484-491.

*Weiner, R., Datz, M., Wagner, D., & Bockhorn, H. (1999). Quality of life outcome after laparoscopic adjustable gastric banding for morbid obesity. *Obesity Surgery, 9,* 539-545.

Wolf, A. M., & Colditz, G. A. (1998). Current estimates of the economic cost of obesity in the United States. *Obesity Research, 6*(2), 97-106.

Appendix C: Survey

1. This semester how often are you in this building?

Once a month or less Once a week or less 2-3 days a week

4-5 days a week Other_____

2. On what floors do you attend or teach class? **(circle all that apply)**

1 2 3

3. How often do you use the elevator in this building?

Never Sometimes A lot Always

4. When you choose to use the elevator why do you do so? **(circle all that apply)**

Too tired to use stairs Elevator saves time Just being lazy

Other:_____

_____

_____

5. a. In this building have you noticed any signs encouraging stair use?

Yes No

b. If so, did the signs prompt you to use the stairs over the elevator?

Yes Somewhat No

c. If so, list all locations you remember seeing a sign?

d. Are there any other factors you think might motivate you or others to choose the stairs over the elevator?

Appendix D: Sign Content, Source, and Location

Content	Source	1st Floor	2nd Floor	3rd Floor
Your heart needs exercise use the stairs	Andersen et al., 1998	Point of choice location	N/A	Point of choice location
Stay Healthy, Save Time, Use the stairs	Blamey et al., 1995	N/A	Bathroom	Bathroom
Take the stairs for your health	Boutelle et al., 2001	Above elevator call buttons	Above elevator call buttons	Above elevator call buttons
Walking up stairs burns almost 5 times more calories than riding an elevator	CDC	Bathroom	N/A	N/A
Don't delay. Climb today. Take the stairs	Mura	Drinking fountain	N/A	Drinking Fountain
Step up. Slim down. Use the stairs	Mura	N/A	Drinking Fountain	N/A

Appendix E: Intervention Sign Example

**Font style will be Times New Roman in 48 size font.

Walking
up stairs
burns almost
5 times more
calories than
riding an
elevator.

Appendix F: Data Collection Template

Obser Init:______ Dte:______ Tme:________________ Est. out temp:________

UP						DOWN					
Wht		Blk		Oth		Wht		Blk		Oth	
Y	N	Y	N	Y	N	Y	N	Y	N	Y	N

UP						DOWN					
Wht		Blk		Oth		Wht		Blk		Oth	
Y	N	Y	N	Y	N	Y	N	Y	N	Y	N

UP						DOWN					
Wht		Blk		Oth		Wht		Blk		Oth	
Y	N	Y	N	Y	N	Y	N	Y	N	Y	N

UP						DOWN					
Wht		Blk		Oth		Wht		Blk		Oth	
Y	N	Y	N	Y	N	Y	N	Y	N	Y	N