Strickler, Angelina P., <u>Social Health Website Intervention</u>. Master of Public Health (Epidemiology), May 2010, 67pp., 10 tables, 7 illustrations, bibliography, 17 titles.

The primary purpose for this research using a social health website intervention implemented on the University of North Texas Health Science Center (UNTHSC) is to gage movement in stage of change for nutrition and physical activity among participating students, staff, and faculty. Each of 42 participants completed a baseline questionnaire on current health practices and stage of change. A dropout rate of 33% left 28 participants who completed the post questionnaire at the end of 6 weeks, during which they utilized the website, www.livestrong.com. A t-test for significance identified the differences between the stage of change scores. The test for stage of change in nutrition showed significant forward movement in pre and post scores, while the test for stage of change in physical activity did not show significant forward movement between pre and post scores. A larger sample size, less specific population, and recruitment over a wider period of months with incentives offered could increase accuracy.

SOCIAL HEALTH WEBSITE INTERVENTION

Angelina Payne Strickler, B.A.

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SOCIAL HEALTH WEBSITE INTERVENTION

THESIS

Presented to the School of Public Health

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For the Degree of

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By

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CHAPTER 1

INTRODUCTION

Statement of the Problem

The Healthy Eating Index score, which is a measure of the overall quality of an

individual's diet collected by the U.S. Department of Agriculture (USDA) from the

National Health and Nutrition Examination Survey (NHANES) for the population during

2000 showed that 74% of people's diets "need improvement" (Basiotis, 2002). The

NHANES also found that 65% of Americans are overweight, which has doubled since the

1980s (CDC, 2010). In addition, nearly 66% of the population of Texas is obese, which is

having a Body Mass Index (BMI) greater than 30 kg/m^2. Texas also has the 6th highest

prevalence rate of obesity in the U.S. There are many risk factors associated with being

overweight or obese, including, but not limited to, increased risk for cardiovascular

disease, diabetes, ischemic stroke, hypertension, heart attack and many types of cancer

(Blanck, 2002).

Because of these factors, many different types of health interventions have been

studied for their successfulness in motivating health behaviors including diet diaries,

group sessions, diets, workout routines and educational sessions (Hollis, 2008). Given the

increased use of the internet for social networking, problem solving and information

gathering, internet based medium seems to be successful at motivating many different

kinds of behaviors in our society today.

Research Question

This research seeks to answer the following research question: Will a social health website intervention alter participant's stage of change for nutrition practices and physical activity among University of North Texas Health Science Center (UNTHSC) students, faculty and staff?

Research Objectives

1. Ascertain current stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

2. Measure six week intervention effect on stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

Significance of the Study

University students, faculty, and staff are a unique population group and are not often measured in dietary assessments of the population due to the isolated cultures often created within the university environment. As it is becoming apparent that chronic disease risk factors can be established in youth and affect the person for the rest of their lives, recent studies have attempted to measure students' health levels (Molnar, 2008; Gerend, 2009). College is the first time students make their own choices and learn to manage their diet and exercise while maintaining academic and social activities. Time and money are limited, thus faster but poorer health choices appear promising. Generally, students do not consider exercise and healthy eating as a priority over social and academic commitments. In addition to this, most students may not be able to afford the more healthful options (Molnar, 2008; Comrie, 2009).

UNTHSC offers studies in public health, science, and medicine. On the UNTHSC campus specifically, there are few restaurants that offer a healthy selection of food near the campus. However, there is a McDonald's within walking distance of the campus. In addition, there is not a cafeteria on campus, but there are vending machines and a snack bar. There is an exercise facility on campus; however, it is small, with fee based classes. The campus is also situated in a very urban area close to down town Fort Worth, with high automobile traffic and limited green space. In addition, this unique population has much public health significance because these students and faculty have the potential to affect public health policy and medical practices in the future.

When examining the general population, easy, accessible, low-priced, high-calorie foods have contributed to the obesity epidemic (Blanck, 2007). The prevalence of obesity is increasing among all age groups, genders and ethnicities in the US. The Center for Disease Control and Prevention (CDC) has assessed American society as being 'obesogenic' or being characterized by environments that promote increased food intake, non-healthful foods, and physical inactivity (Zizzi, 2003). A recent prospective health study has shown that a 10-15 lb gain in weight is associated with increased risk for CHD and diabetes (Blanck, 2007). A 20-45 lb gain in weight is associated with an increased risk for ischemic stroke and postmenopausal breast cancer (Blanck, 2007). Substantial epidemiologic evidence indicates that obesity is not only associated with these varying risk factors but is also associated with an increased risk for death and overall decrease in well-being (Blanck, 2007). Given all of this, it is very important that effective and

successful interventions be used to change these types of health behaviors in the population.

      The results of this intervention will be able to provide university program managers and policy analysts with a beneficial tool for an influential and significant population. This particular study population consists of current and future public health and medical professionals who should be well educated and informed about healthy nutritional and physical activity practices. If there is a failure to live a healthy lifestyle in the people who are representing health and educating the rest of the population, then we will have failed the population. This study has the potential to contribute to educational research and policy by testing an internet based health behavior intervention. As many other studies have tested the success of diet diaries, counseling groups and educational materials, this study has tested the success of a social health website on a small scale (Hollis, 2008). This approach could be permanently adopted by the UNTHSC, or other institutions and businesses for more extensive use.

CHAPTER 2

LITERATURE REVIEW

Background

There is a growing awareness regarding physical fitness and healthy nutrition choices among people in the United States as a result of media and public health campaigns (Burke, 2008; Margolis, 2001). Current studies surveying health behaviors after being exposed to a particular form of health education have also been previously conducted. These studies examined the effects of education and counseling on physical activity, diet and risk of specific diseases. A randomized controlled trial examining the effectiveness of patient-centered lifestyle counseling sessions on physical activity, diet and coronary heart disease (CHD) risk factors suggested that CHD risk was reduced among those who attended multiple sessions of client-centered counseling (Hardcastle, 2008). Another study examined cardiac rehabilitation patients who were educated and provided a proper diet. Rates of diet adherence were calculated and found to be sub-optimal (Molnar, 2008). Dietary and physical activity education and their relationship to behavior change remain questionable. Further efforts to identify effective education techniques and barriers to behavior change are needed to improve overall health and decrease risk factors.

The behavior model for the relationship between social factors and education on: physical activity, diet, alcohol consumption, and weight control was reported to be attributed to differences in health behaviors and were used in the development of the intervention and survey questions (Ball, 2003).

Stages of Change

The structure for this intervention was based primarily on the Stages of Change Theory and the Integrated Theory of Health Behavioral Change (ITHBC). The Stages of Change Theory was developed originally to compare smokers in therapy to self changers. The rationale behind the "stages" was to create a therapy that met a persons needs at his or her particular point in the recovery process. The idea behind using this as the primary measurement is based on the capabilities of the stages of change to focus on psychological and motivational changes rather than only behavioral. The stages of change can also measure changes over a smaller period of time and measure changes in behavior that are not detectable with traditional nutritional and physical activity behavior measurements. These five stages of pre-contemplation, contemplation, preparation, action, and maintenance are presented as a cyclical process that can vary from individual to individual (Denison, 1996). Figure A-1 in the Appendix displays The Stages of Change Theory adapted to this intervention.

The ITHBC was also used in this intervention to examine health behavior change processes at a more detailed level than the Stages of Change Theory. The ITHBC supports the theory that health behavior change can be improved by promoting knowledge and beliefs, increasing self regulation skills and enhancing social facilitation. According to ITHBC, people are more likely to engage in better health behaviors if they have the appropriate information, embrace the health beliefs, develop self regulating abilities to change the behavior and experience positive social influences towards this specific behavior (Ryan, 2009). The figure for ITHBC is shown in Appendix A.

Other Interventions

An intervention study was performed at six universities (n=476) using a web based nutrition and physical activity education program. Mystudentbody.com was designed to educate and promote healthful habits thus possibly promoting change in behaviors. Participants were randomized into treatment and control groups and assigned to specific web sessions. They completed a baseline assessment, a three, and a six month assessment. This program demonstrated an increase in fruit and vegetable consumption, positive changes in motivation to change dietary behaviors, greater nutritional knowledge, and advancement in the stages of change (Franko, 2008).

Other email based interventions have been implemented at job sites and were found to be successful. A study conducted on a corporate website (n=84) used weekly emails sent to participants for 12 weeks, with dietary tips and small goals for the week tailored to the individual's selection in the baseline survey. The post survey analysis demonstrated significant improvement in stage of change, a significant increase in fruit and vegetable consumption, and a decrease in intake of fat (Block, 2004). In addition, a highly publicized study completed last year examined methods for improving long-term weight management. This randomized trial was conducted over a 6-month period with 1,685 participants. Goals were provided to participants consisting of: eating fewer calories, exercising regularly, recording daily food intake and physical activity, attending intervention group sessions, following the Dietary Approaches to Stop Hypertension (DASH) eating style, eating a low sodium diet, and limiting alcohol consumption. The most significant predictors for higher weight loss included more group sessions attended,

more food records kept per week and more minutes reported of moderate-intensity

physical activity per week (Hollis, 2008).

CHAPTER 3

METHODOLOGY

Website Intervention

The intervention conducted on UNTHSC campus consisted of a free, health

centered social media website (http://www.livestrong.com), which provides information

and tips on healthy nutrition and physical activity, allows users to: set goals, keep a daily

food and physical activity record, calculate calorie intake and expenditure (The Daily

Plate) and provides social encouragement. When compared to other free online health

websites such as Gimme20.com, myrevolutionhealth.com, and Trusera.com,

livestrong.com has one of the most exhaustive food and exercise databases. It is

extremely user friendly and owns The Daily Plate website. Overall, it appears to be the

most comprehensive choice for a free online health website that includes health

information, nutrition, physical activity diaries and social networking. The intervention

was volunteer based and held within the UNTHSC student, faculty and staff population.

The intervention goals for use of this website consisted of the diet and physical activity

diary, social networking, group discussion, and access to health information. The figure

for Theoretical Framework is shown in Appendix A.

Recruitment

The study population was recruited during a one month period prior to beginning

the intervention via mass emails, campus news, flyers, and School of Public Health

classes. Participants were contacted via email and given a baseline online questionnaire

to determine daily physical activity, dietary intake, and current stage of change for

nutrition and the stage of change for physical activity. Incentives were included to boost

participation and reduce drop-out rates. The top ten participants who had the highest rates

of participation were entered into a drawing to win three prizes. First place prize was a

six month gym membership to 24 hour fitness, second place was a gift certificate to

Footlocker and third place was a gift certificate to Central Market. Participants were also

given visual step-by-step instructions on how to use the website prior to the start of the

intervention.

<div align="center">Timeline</div>

1. Participants were recruited over a one month period using methods mentioned in

recruitment section above.

2. All participants who provided the investigator with their name and email address were

added to the distribution list which was kept in Excel format. These were the identifiers

used throughout the survey. Research data, in hard copy or electronic form were stored

and managed in a secure manner following NIH guidelines and according to state and

institutional policies and practices. At all times, only listed key personnel specifically

designated and authorized by the Principal Investigator had access to any research related

documents.

3. A week prior to the start date of the intervention, all contacts on the distribution list

were emailed a link to the online pre-survey, as well as directions on how to use the

www.livestrong.com website. Completion of this online survey was considered as giving

consent to participate in the intervention. A total of 46 participants completed the survey,

but one was not a current UNTHSC student, and three did not complete the stage of

change sections of the survey. These four participants were removed, resulting in 42 total participants.

4. Once the intervention began, participants were emailed a link to an online weekly survey that asked questions about participation in order to gauge use and encourage further participation. These surveys collected the participant's www.livestrong.com username and were used to match this to all of their other surveys and their activities on the website. Participants were also emailed a copy of instructions on how to use the website, and asked to join the group created by the investigator named, "UNTHSC Intervention Group".

5. On a weekly basis, the investigator monitored the activities on the website group. Any social uses of the website, such as posting to the discussion board, and engaging in group dares or goals were monitored as well. The investigator responded to comments made on the discussion board and posted helpful advice about using the website.

7. If a participant wished to withdraw from the intervention, they were able to email the investigator stating such and their name would be removed from the database.

8. After the 6th week of the intervention, the participants were emailed a link to the online post survey. The answers to this online survey were exported from the site in Excel format and kept secure. Only 28 of the original 42 participants completed the post survey, therefore everyone else was considered a drop out (33% drop out rate).

9. Participants were also asked to export a copy of their Daily Plate data from the website into excel and email this to investigator. This data was used to determine prize winners. Nine participants submitted their Daily Plate exports, so all were entered into

the random drawing. The principle investigator picked three of the numbers, and those

associated participants were awarded the prizes in the order that they were picked: first,

membership in 24 Hour Fitness, second, Gift Card to Footlocker and third, Gift Card to

Central Market. The winners were alerted via a congratulatory email and asked what the

best way to mail them their prize is.

Inclusion Criteria

The only inclusion criterion was that the participant be a student, faculty or staff

member at UNTHSC during the intervention. After completing the baseline

questionnaire, participants were asked to participate in The Daily Plate at

www.livestrong.com for six weeks. During this time, they were encouraged to report as

many diet and physical activity records as possible, as well as engage in social

discussions in the group forum and in goal setting.

Exclusion Criteria

The only exclusion criteria were if participants were not UNTHSC students,

faculty or staff or were currently actively engaged in using The Daily Plate at

www.livestrong.com. These participants were screened out in the baseline survey due to

the potential for biased results if they have already been exposed to the intervention

medium.

Controlling Factors and Drop-Outs

The questions in the Post-Test and Weekly Survey measured how much each participant

utilized the website and reported their diet and activity. In addition, other variables such

as age and internet usage might have an effect on the outcome the website intervention

had on the participant. These measures were assessed in the data analysis by stratifying

between age and internet use. Self rated internet use was gathered from the participants

during the pre survey. After looking at the weekly surveys, it was determined that this

data would not be used in the intervention because it was repetitive of the post survey

questions. The weekly surveys served as good reminders for participants to use the

website, but several participants who filled out the post survey did not complete all of the

weekly surveys. Whether or not the participants completed a post survey or not was used

to determine whether they dropped out or remained in the study. Drop-outs were

analyzed using a chi-square test in the analysis section to determine differences between

those who remained in the study and those who did not.

Pre-Test

Table 1: Subjects of Pre-Test Questions

Pre-Test Subjects
1. First name, last name, and email address
2. If they are currently using Livestrong.com
3. If they are UNTHSC students, faculty, or staff
4. If they have ever used a health website before
5. Self rated internet proficiency
6. Demographics including gender, age, classification, academic program, height, and weight
Pre-Test Variables
Stage of Change based on the Cancer Prevention Research Center –
1. 20 continuous measure questions for nutrition
2. 20 continuous measure questions for physical activity

Post-Test

Table 2: Subjects of Post-Test Questions

Post-Test Subjects
1. First name, last name, and email address
2. If they logged on to The Daily Plate at www.livestrong.com:
a. How many days per week did they fill out a diet or physical activity record?
b. How many days did they log their nutritional information?
c. How many days did they log their physical activity?
3. How often they use the internet in and outside of work
4. If they feel that they are better informed about nutritional and physical health.
5. If they feel that they have increased motivation towards improving their diet or increasing their exercise.
6. If they feel that they improved their diet or increased their exercise.
7. If they think they will continue using The Daily Plate at www.livestrong.com.
8. Physical activity memberships or diet activities involved in currently
9. Demographics including gender, age, classification, academic program, height, and weight
Post-Test Variables
Stage of Change based on the Cancer Prevention Research Center –
1. 20 continuous measure questions for nutrition
2. 20 continuous measure questions for physical activity

Weekly Survey

Table 3: Weekly Survey Questions

Weekly Survey Questions
1. Did participant log onto website this week?
2. How many days did participant log on this week?
3. How many days did participant report nutrition and physical activity?
4. Did participant participate in group discussions?
5. Did participant read any addition information on the website?
6. Did participant set any group or individual goals?
7. Reasons for not participating in the website this week?

Stage of Change Score

The Stage of Change (SOC) score is calculated by adding together the points assigned to an item on the pre-survey. After establishing total points for each stage, participant is assigned to the stage with the highest score. The participant is then assigned the corresponding number for that stage of change (1=pre-contemplation, 2=contemplation, 3=preparation, 4=action, 5=maintenance). The score difference is calculated by subtracting the post-intervention SOC Score from the pre-intervention SOC Score. The difference score is inversely related to the improvement in self perception of nutritional and physical activity. An improved score will be negative. For example, if a participant scores the highest in stage 2 (contemplation) before the intervention and moves to stage 4 (action) after the intervention, the difference score is -2. The example below provides a visual representation of the inverse relationship.

Figure 1: SOC Score Inverse Relationship

5 (Maintenance)

4

3

-2

2

1 (Pre-contemplation)
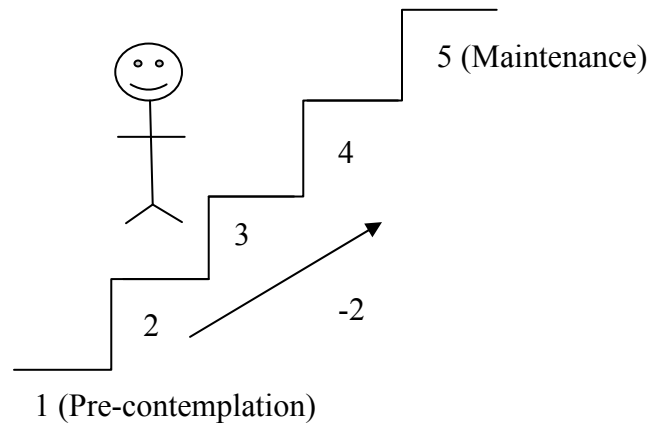
CHAPTER 4

ANALYSIS

Data collection was accomplished using an online survey site that stores

participant's responses in a database and allows the data to be exported into MS Excel.

This data was then analyzed using Statistical Analysis Software (SAS).

Variable Construction

There were several new variables created during the data analysis. The difference

between nutritional SOC scores was created by subtracting participant's post nutritional

SOC score from the pre nutritional SOC Score. The difference between physical activity

SOC scores was created by subtracting participant's post physical activity SOC Score

from the pre physical activity SOC Score. These two variables were created to measure

the difference in self perception of nutritional and physical activity. The difference score

will be referred to throughout the results section when discussing the difference in pre-

post intervention perceived behavior change. The difference between BMI was created by

subtracting the participant's post BMI from their pre BMI. This variable was created for

demographic analysis. The new age category was created by combining participant's age

into two categories; those reporting age less than 30, and those reporting age equal to or

more than 30. The new internet use variable was created by combining internet use into

two categories; those reporting internet use as average or good, and those reporting

internet use as excellent. These two variables were created so that they could be assessed

for collation.

Test for Normality

The normality of the data was tested using the Shapiro-Wilk test and Anderson-Darling test; however, these tests did not sufficiently analyze very small sample sizes. The reason for using both of these tests is that they assess normality differently. The Shapiro Wilk test is used in sample sizes of 2,000 or less and is based on the ratio of the best estimator of the variance. The Anderson Darling test is based on the squared difference. When considering the Shapiro-Wilk test, if the p-value is less than the alpha value, reject the null hypothesis that the data is normal. For nutritional score difference, the p-value = .0005 and the Alpha value = .835. For physical activity score difference, the p-value = .028 and the Alpha value = .908. Thus the null hypothesis was rejected (see below in Figure 5). When considering the Anderson-Darling test, if the alpha value is greater than .751, then we reject the null hypothesis that the data is normal. For nutritional score difference, the Alpha value = 2.42. For physical activity score difference the Alpha value = 1.07. Thus, the null hypothesis was rejected (see below in Figure 6).

Because of the small sample size and its effect on these tests, the data was graphically examined using histograms (Appendix Figures A-7 and A-8). The data appeared normal when displayed graphically, thus we are able to use the t-test. The t-test was chosen because it was also used in similar analysis with stage of change and small sample size in Zizzi's "Impact of a Brief Workshop on Stage of Change Profiles in Athletes." (Zizzi, 2003). In addition to these tests for normality, the difference in nutritional and physical activity score was transformed using log, natural log, square root, and the reciprocal, but the results revealed a less normal distribution.

Analysis Procedures

The primary analysis consisted of calculating each stage of change score of each participant for nutrition and physical activity, for both the pre-test and post-test. The statistical difference between the means was then assessed using a t-test. This test assesses whether the intervention (independent variable) had a significant effect on stage of change (dependent variable) for the participants. Percentages of participants in each SOC score category were also compared before and after intervention. This method of analysis is similar to the analysis by Zizzi et al. (Zizzi, 2003).

A subgroup analysis was also performed to assess whether age and internet use modify the association. The literature demonstrates that young people use the internet more than people who are older and more readily use social media websites; therefore, it makes a difference in association by age and internet use possible (Franko, 2008).

CHAPTER 5

RESULTS

Primary Analysis

Demographic

As shown in Table 4, of the 42 participants, the sample was primarily female (85.7%). The average age was 32 years with 70% being less than 30 years old. The entire sample ranged from 22 to 63; 53.7% were students, 41.5% were staff, and 4.9% were faculty. In addition, 50% were from the School of Public Health (SPH), 26.3% were from other (this could be hypothesized as staff since they do not associate with a particular school), 10.5% were from the Texas School of Osteopathic Medicine (TCOM), 7.9% were from the Graduate School of Biomedical Sciences (GSBS) and 5.3% were from the Physician's Assistant (PA) School. Of the total participants, 28 completed the post-intervention survey and are included in the calculations for score differences.

Figure 4:
Demographic Variables

Item Description	#	%
Demographic		
Age (n=42)		
Age < 30	29	69.0
Age ≥ 30	13	31.0
Average Age	32	
Gender (n=42)		
Female	36	85.7
Male	6	14.3
School Classification (n=41)		
Student	22	53.7
Faculty	2	4.9
Staff	17	41.5
Academic Program (n=38)		
TCOM	4	10.5
SPH	19	50.0
GSBS	3	7.9
PA	2	5.3
Other	10	26.3

Nutritional Activity

As shown in Table 5, participant's estimated dietary intakes before the intervention were as follows; 1.7 fruit servings, 2.1 vegetables servings, 1.6 dairy servings, 3.1 grain servings, and 2.5 protein servings. The average estimated dietary intakes after the intervention increased for vegetables, dairy, and grain, remained the same for protein, and decreased for fruit.

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Table 5:
Mean Nutritional Practices

	Nutritional Practices	
Dietary Intake	**Pre-Intervention (n=41)** (servings/day)	**Post-Intervention (n=28)** (servings/day)
Fruit	1.7	1.5
Vegetable	2.1	2.4
Dairy	1.6	2
Grain	3.1	3.2
Protein	2.5	2.5

A. Objective 1: Ascertain current stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

The pre intervention nutritional SOC Scores were assessed and 14.3% of participants were in the pre-contemplation stage, 47.6% were in the contemplation stage, 7.1% were in the preparation stage, 11.9% were in the action stage, and 19% were in the maintenance stage.

B. Objective 2: Measure six week intervention effect on stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

The post intervention nutritional SOC Scores were assessed and 0% of participants were in the pre contemplation stage, 46.4 % were in the contemplation stage, 7.1% were in the preparation stage, 14.3% were in the action stage, and 32.1% were in the maintenance stage (as shown in Figure 2 and Table 6).

The mean difference between stage of change scores for nutrition was assessed using the t-test. There was a significant difference between pre and post nutritional SOC scores (t-value of -2.39, p-value of 0.024). The difference score is inversely related to the intervention's success, thus a negative t-value shows that on average, study participants made positive changes after the intervention.

Figure 2:
Before and After Percentages of Participants in Each Nutritional SOC Score Category
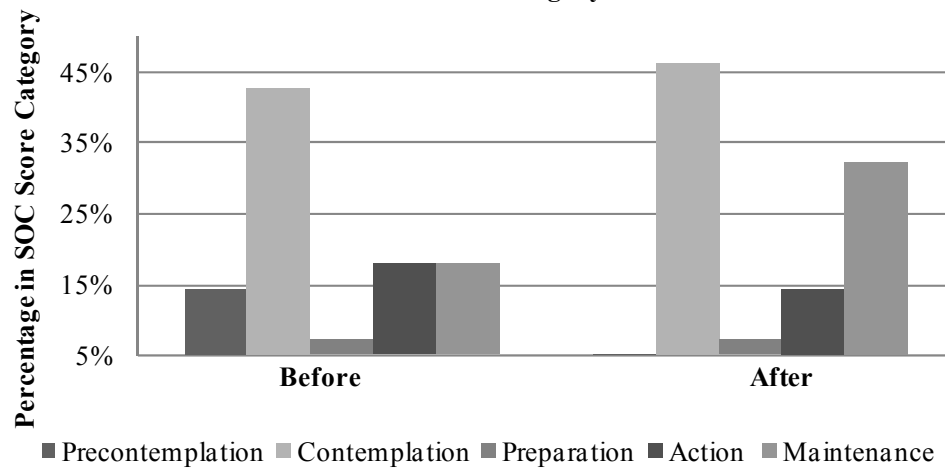
As shown in Table 6 below, one of the post intervention variables measured whether the participants perceived that their diet had improved. Half of the sample reported that their diet had improved.

Table 6:
Stage of Change Score Variables

Stages of Change	Nutritional Practices			
	Pre-Intervention (n=41)		Post-Intervention (n=28)	
	#	%	#	%
Pre-Contemplation	6	14.3	0	0.0
Contemplation	20	47.6	13	46.4
Preparation	3	7.1	2	7.1
Action	5	11.9	4	14.3
Maintenance	8	19.0	9	32.1
	Physical Activity Practices			
	#	%	#	%
Pre-Contemplation	3	7.1	0	0.0
Contemplation	18	42.9	13	46.4
Preparation	4	9.5	2	7.1
Action	8	19.0	4	14.3
Maintenance	9	21.4	9	32.1

Physical Activity

As shown in Table 7 below, 31% of participant's reported spending less than 60 minutes a week in regular physical activity, 31% reported spending 80 to 150 minutes, and 38.1% reported spending 200 to 350 minutes. 61.9% of participant's reported spending less than 60 minutes a week in strenuous physical activity, 19% reported spending 90 to 160 minutes, and 19% reported spending 200 to 300 minutes.

A. Objective 1: Ascertain current stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

The pre intervention physical activity SOC Scores were assessed and 7.1% of participants were in the pre-contemplation stage, 42.9% were in the contemplation stage, 9.5% were in the preparation stage, 19% were in the action stage, and 21.4% were in the maintenance stage.

B. Objective 2: Measure six week intervention effect on stage of change for nutrition practices and physical activity among UNTHSC students, faculty, and staff.

The post intervention physical activity SOC Scores were assessed and 8% of participants were in the pre-contemplation stage, 36 % were in the contemplation stage, 4% were in the preparation stage, 12% were in the action stage, and 40% were in the maintenance stage (as shown in Figure 3).

Figure 7:

Mean Physical Activity Practices

Physical Activity Practices				
Weekly Regular Physical Activity (n=42) (mins/week)	**Pre-Intervention (n=42)**		**Post-Intervention (n=28)**	
	#	%	#	%
< 60 minutes	13	31.0	5	17.9
80 to 150 minutes	13	31.0	10	35.7
200 to 350 minutes	16	38.1	13	46.4
Weekly Strenuous Physical Activity (n=42) (mins/week)				
	#	%	#	%
< 60 minutes	26	61.9	17	63.0
90 to 160 minutes	8	19.0	6	22.2
200 to 300 minutes	8	19.0	4	14.8

The mean difference between stage of change scores for physical activity was assessed using the t-test. There was no significant change between pre and post physical activity SOC scores (t-value of -1.11, p-value of 0.28).

Figure 3:
Before and After Percentages of Participants in Each Physical Activity SOC Score Category
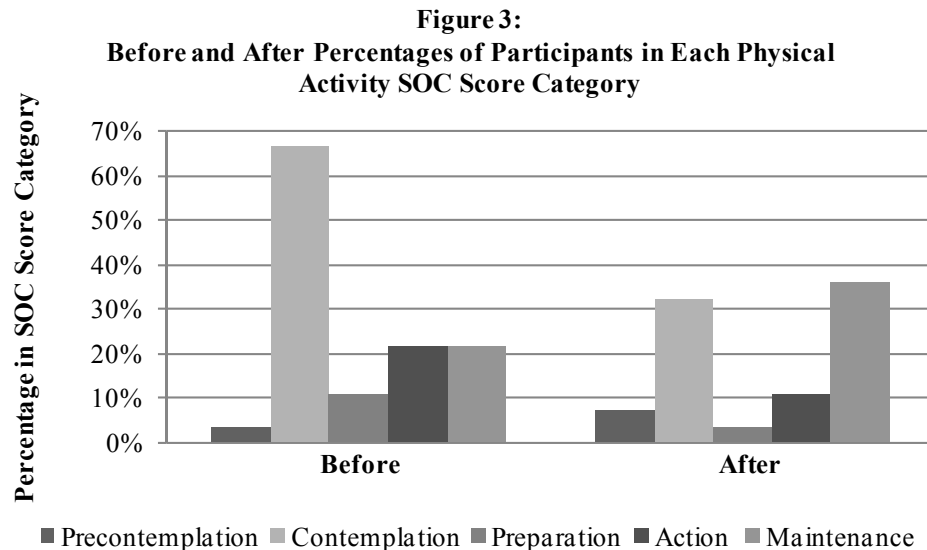
As shown in Table 6, one of the post intervention variables measured whether the participant perceived that their physical activity had increased. 45.5% reported yes, and 54.5% reported no.

Other Variables

As shown in Table 8, more than 90% of participants rated themselves as "good" or "excellent" users of the internet and there was a slight decrease post intervention. This could have been due to participants re-evaluating their internet proficiency after using Livestrong.com. Before the intervention, about 45% of participants reported having an underweight to normal BMI (calculated from self reported height and weight), and about 45% reported having an overweight to obese BMI. In addition, the pre-intervention

average BMI was 27. After the intervention, about 42% of participants reported having an underweight to normal BMI, and about 58% reported having an overweight to obese BMI. In addition, the pre-intervention average BMI decreased to 26. These numbers indicate that participants were at least maintaining, if not losing some weight. Before the intervention, 30 % reported that they did not use other health websites, but after the intervention, about 60% reported using other health websites. Utilizing the website Livestrong.com could have motivated them to explore other health related websites.

As shown in Table 9, 55% of respondents used the Livestrong.com website 1-3 days per week, 15% used the website 4-5 days per week, and 30% used the website 6-7 days per week. There were several post intervention variables that assessed perception. 85.7% of respondents felt they were more informed about nutrition and physical activity. 72.7% of respondents felt that they had more motivation for diet and exercise. Lastly, 81.8% of respondents felt that they would continue to use the Livestrong.com website.

Other Variables				
Internet Use	**Pre-Intervention (n=42)**		**Post-Intervention (n=28)**	
	#	%	#	%
Excellent	29	69.0	16	57.1
Good	11	26.2	11	39.3
Average	2	4.8	1	3.6
Poor	0	0.0	0	0.0
Use of Other Health Websites	**(n=27)**		**(n=27)**	
	#	%	#	%
Yes	8	29.6	16	59.3
No	19	70.4	11	40.7
BMI (kg/m^2)	**(n=42)**		**(n=26)**	
	#	%	#	%
Underweight (<18.5)	1	2.4	1	3.8
Normal (18.5-24.9)	18	42.9	10	38.5
Overweight (25-29.9)	14	33.3	11	42.3
Obese (30+)	9	21.4	4	15.4
Mean BMI	27 ± 8.42		26 ± 4.8	

Subgroup Analysis

Nutritional Activity

As shown in Figure 4, age was categorized into two groups: age < 30 years and age ≥30 years. The new variable of age was assessed for potential effect modification on the association between intervention and stage of change in nutrition scores. The change between pre and post intervention was stronger and statistically significant among the

younger population (t-value of -2.44, p-value of 0.029) but was weaker and not

significant among the older population (t-value of -0.82, p-value of 0.427). Thus, the

change between pre and post intervention was more profound in younger people than in

the older population.

Table 9:
Post Intervention Characteristics

Post Intervention Variables	#	%
Number of Days of Website Use (n=20)		
1-3 days	11	55.0
4-5 days	3	15.0
6-7 days	6	30.0
Do you feel you are more informed about nutrition and physical activity? (n=21)		
Yes	18	85.7
No	3	14.3
Do you feel you have increased motivation for diet and exercise? (n=22)		
Yes	16	72.7
No	6	27.3
Do you feel you have improved your diet? (n=22)		
Yes	11	50.0
No	11	50.0
Do you feel you have improved your physical activity? (n=22)		
Yes	10	45.5
No	12	54.5
Will you continue to use Livestrong.com? (n=22)		
Yes	18	81.8
No	4	18.2

For younger people, the change was significant. When comparing the stratified statistics

to the crude statistic of nutritional difference score, it appears that age causes an effect

modification between the two groups.

Figure 4:
Nutritional SOC Score Difference
By Age
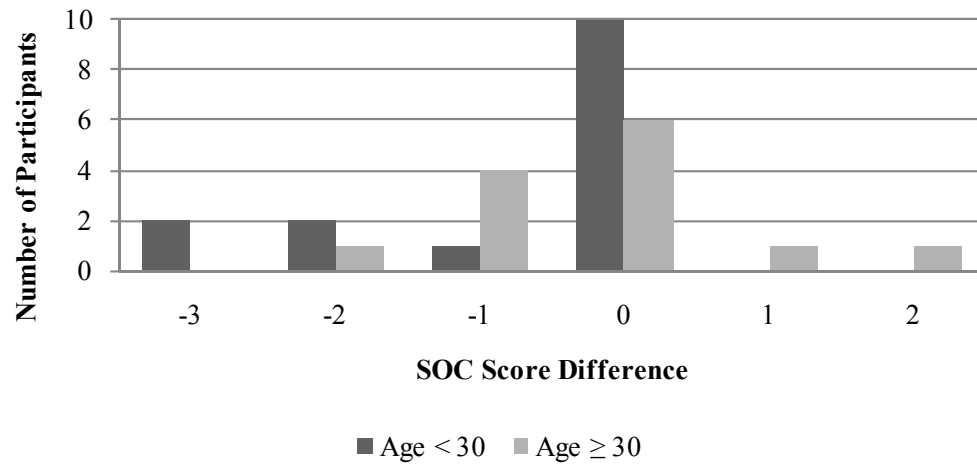
As shown in Figure 5, internet use was categorized into two groups: an excellent category, and a good/average category. The new variable of internet use was assessed as a potential affect modifier on the association between intervention and stage of change in nutrition and physical activity scores. The change between pre and post intervention was similar between the excellent internet user (t-value of -1.43, p-value of 0.172) and the good/average internet users (t-value of -1.94, p-value of 0.082). Neither of the association was statistically significant. Thus, Internet use did not modify the effect of intervention on stage of changes in nutrition scores.

Figure 5:
Nutritional SOC Score Difference
By Internet Use
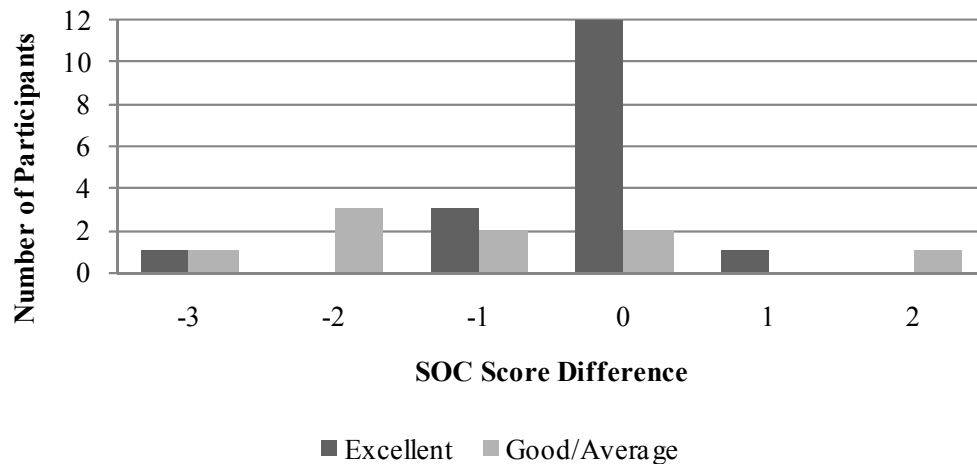
Physical Activity

As shown in Figure 6 below, physical activity was categorized into two groups: age < 30 yrs and age ≥30 yrs old. The new variable of age was assessed for potential effect modification on the association between intervention and stage of change in physical activity scores. The change between pre and post intervention was slightly significant statistically among the younger population (t-value of -2.44, p-value of 0.051) but was weaker and not significant among the older population (t-value of 0.67, p-value of 0.518). Thus, the change between pre and post intervention was slightly more profound in younger people than in the older population. When compared to the crude statistic of physical activity difference score, age did not modify the effect of intervention on stage of changes in physical activity scores.

Figure 6:
Physical Actvity SOC Score Difference
By Age
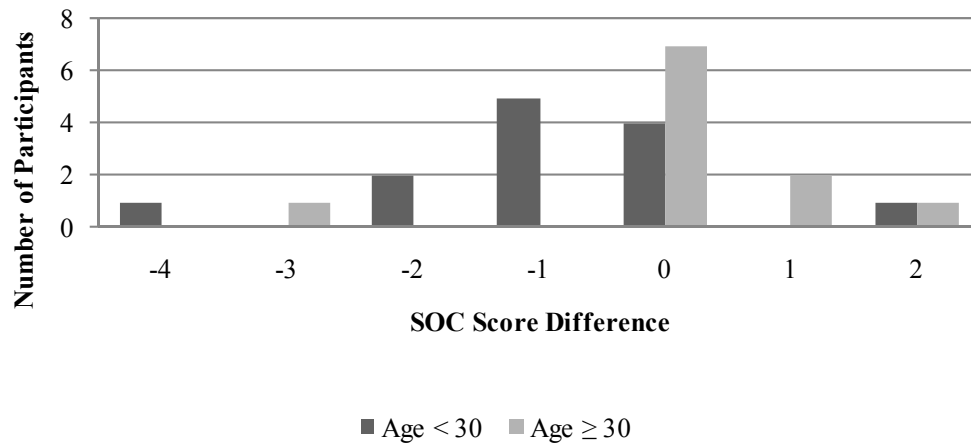
As shown in Figure 7, internet use was categorized into two groups: an excellent category, and a good/average category. The new variable of internet use was assessed as a potential affect modifier on the association between intervention and stage of change in physical activity scores. The change between pre and post intervention was not similar between the excellent internet user (t-value of .17, p-value of 0.867) and the good/average internet users (t-value of –2.22, p-value of 0.045). Thus, the change between pre and post intervention was more profound in good/average internet users than in excellent internet users. When compared to the crude statistic of physical activity difference score, internet use did not modify the effect of intervention on stage of changes in physical activity scores.

Figure 7:
Physical Activity SOC Score Difference
By Internet Use

Legend: ■ Excellent ■ Good/Average
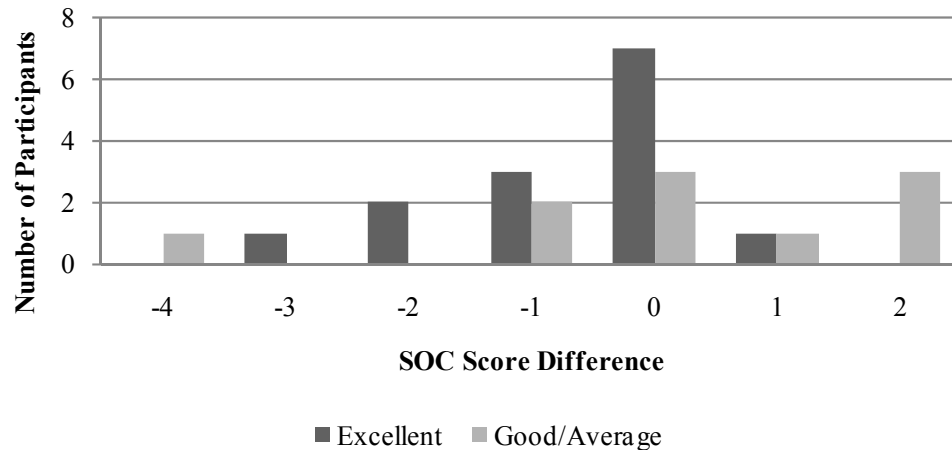
Missing Subjects

To determine if there were differences between those who remained in the study

and those who dropped out, a chi-square test was performed on missing and non missing

values for basic demographics, BMI, and internet use. As shown in Table 10, the chi-

square values for all variables but age are greater than .05, indicating that the SOC Score

Differences are distributed similarly across the different levels of gender, school

classification, academic program, internet use, and BMI. Age is the only variable that has

a chi-square value less than .05 (p-value = .04). In this particular case it can be

hypothesized that the SOC Score Differences are not distributed similarly across the

different levels of age. In other words, it appears that those who are younger than 30

years old are more likely to drop out than those who are age 30 and older. When looking

at Table 10, it can be seen that for participants less than 30 years old, those who remained

in the study and those who dropped out of the study are spread out evenly, but 86.7% of

33

those 30 years and older did not drop out. The difference between ages does not have a

highly significant statistic, but is something to consider when structuring future

interventions at schools. It could be that those participants who were older were more

committed to staying in the intervention through the end. The older population may also

have been made up mostly of staff and faculty, while the younger population was mostly

students, who tend to have more variable schedules and examination times.

Table 10:
Missing vs. Non-Missing Respondents - SOC Score Difference

	Missing # (%)	Non-Missing # (%)	χ^2	p-value
Age			4.2	0.04
<30	12 (44.4)	15 (55.6)		
≥30	2 (13.3)	13 (86.7)		
Gender			0.88	0.35
Male	3 (30.6)	3 (69.4)		
Female	11 (50)	25 (50)		
School Classification			0.61	0.74
Student	6 (27.3)	16 (72.7)		
Faculty	1 (50)	1 (50)		
Staff	3 (35.3)	11 (64.7)		
Academic Program			3.9	0.42
TCOM	1 (25)	3 (75)		
SPH	7 (36.8)	12 (63.2)		
GSBS	0 (0)	3 (100)		
PA	0 (0)	2 (100)		
Other	5 (50)	5 (50)		
Internet Use			1.05	0.3
Excellent	14 (35)	26 (65)		
Good/Average	0 (0)	2 (100)		
BMI			0.19	0.66
Underweight/Normal	7 (36.8)	12 (63.2)		
Overweight/Obese	7 (30.4)	16 (68.6)		

CHAPTER 6

DISCUSSION, CONCLUSIONS, AND RECOMENDATIONS

Discussion

The purpose of using stage of change as the primary measure for this intervention is to gage the forward movement of each respondent. Across time, stage of change has been used in smoking cessation interventions and other behavioral lifestyle changes. Stage of change measures participant's perception of their own self improvement, which is important when measuring behavioral interventions. The study concluded that the use of a social health website intervention implemented on the University of North Texas Health Science Center (UNTHSC) campus demonstrated statistically significant forward motion for nutritional practices; however, it does not show a significant change for physical activity. The results also support the literature concerning stage of change improvement for nutritional practices seen in the Block et al. study. Block et al. also noted statistically significant forward movement in stage of change for dietary practices (Block, 2004). Another study by Franko et al noted that fruit and vegetable intake increased, and that there were positive changes in motivation to change dietary behaviors. However, there was no significant difference found in stage of change for physical activity of participants after the intervention (Franko, 2008). These findings agree with both nutritional and physical activity findings in this intervention.

From Figures 2 and 4, it appears that those who were in nutritional pre-contemplation and action stages before the intervention experienced forward motion into either contemplation or maintenance stages, showing improvement. However, it appears

that those who were in physical activity contemplation stages before the intervention moved backwards into the maintenance and pre-contemplation stages, making it hard to determine whether there was a general improvement in stage of change for physical activity.

It is also noted in Figures 3 and 5 that age seems to act as an effect modifier on the difference between pre and post perceived behavior change among participants. The literature demonstrates that young people use the internet more than people who are older, thus it is justifiable that there is a difference in association in intervention by age (Franko, 2008).

The intervention not demonstrating a significant forward movement for physical activity could be due to the fact that Livestrong.com was focused more on nutrition and logging food intake into The Daily Plate than on exercising. The Daily Plate centered on calorie goals, which could be affected by physical activity, but was mainly affected by diet. In addition, the intervention took place during the fall-winter months (November 9, 2009 – December 18, 2009), during which outside physical activity is decreased compared to the rest of the year. It could have been more strenuous to start new exercise activities such as running, swimming, bicycling, sports activities, etc. However, changing one's diet and eating less or different foods is not largely affected by climate or season, and would be an easier change to make during colder months. Also, in general, committing to exercising more or taking up new activities takes more time out of the day and requires more of an effort when compared to altering ones diet. Diet change may not require as much extra time to be spent, and can be done more consistently in the same

environment. From Table 10 it seemed that there was a higher rate of drop outs for those who were less than 30 years old when compared to the older population. This could also be due to the fact that those who are younger are mostly students and have more readily changing class schedules, often commute to school or spend considerable time preparing for exams, and other duties. The intervention lasted through final exam weeks. When consulting the weekly surveys, there were frequent comments from participants concerning not having enough time to use the website, having to study for exams, or being very busy. These issues seem as if they may have had some effect on the intervention, as any longitudinal intervention will have.

Public Health Policy Implications

The results of this intervention have the potential to provide university program managers and policy analysts with a beneficial tool for the UNTHSC population. Along with other health initiatives on campus, such as Walk Across Texas, and Tuesday Interludes, utilizing a free website could be another tool used to promote healthy behaviors among the UNTHSC population. UNTHSC could adopt a health website as part of normal information that is given to new students, faculty and administration, and advertised regularly via email and around campus. Livestrong.com is one of the many free health websites found online. Utilizing a health based website may have indirect affects upon chronic diseases, e.g. workplace programs can lead to a healthier staff, lower number of sick days, and increased attendance within the workforce overall. As shown in Table 9, high percentages of participants reported feeling more informed about diet and exercise, felt an increased motivation for diet and exercise, and planned to continue using

the website. All of these results indicate an overall better quality of life for the individual. Table 8 shows a decrease in average BMI from 27 to 26, indicating the participants were able to either maintain or lose weight during the intervention. All of these effects lead to a decrease in risk factors such as high blood pressure, diabetes, and obesity which eventually lead to a decrease in diseases such as stroke, heart attack, and cancer. If examined on a larger scale, the results of this intervention can be incorporated into other universities' or businesses' strategies for the improved health of their students, faculty, and employees. Work place polices could be implemented offering incentives or rewards to employees for utilizing health websites. Some employers offer cash incentives to employees who have regular yearly physicals. Utilizing a health website could serve as another alternative towards improving employee health. Worksite wellness is also about more than just encouraging healthy lifestyles among employees, it is about creating a healthier bottom line. Investing in the health of employees helps control and reduce employer costs of healthcare insurance premiums, which is of great benefit to the business as a whole.

In addition, current cultural norms are increasingly adopting social media as the new means for communication, self expression, network and organization building, advertising and promotion as well as correspondence. Social media is used on computers and phones, in businesses, school, and at home. There is an application for almost every game, service, and website. Knowing this, and the fact that the United States is currently going through an epidemic of obesity, social media can be used as a tool to reach the current population. Livestrong.com combines both the old approaches of diet diaries and

calorie counting and transforms them into an alternative that today's population can better relate to and utilize in order to lose weight and increase ones overall health and well being.

<div align="center">Possible Study Limitations</div>

Our study sample size is small, which may affect the precision of the study results. Had the sample size been larger, the p-values may have been more precise, therefore showing more significant results. On the other hand, the findings from our study may be only due to chance. Future studies with a larger sample size are needed to confirm our findings. In addition, our study was conducted on UNTHSC students, faculty and staff. The conclusions gathered from this study may not be able to be generalized to other populations.

Using pre-set stage of change questions may not accurately measure the stage of change that every person is in. While these set questions may accurately reflect some respondent's stage of change, other respondent's stage of change may not be as clear due to the statistical accuracy of each individual question to measure what is intended. The stage of change questions may also measure current feelings and emotions at the moment, rather than an average of feelings overall. Participants may provide more reflective thoughts rather than what their general behavior actually was at the beginning and end of the intervention. This problem could be addressed by using actual dietary and physical activity measures such as diet diaries, 24 hour food recalls, and Food Frequency Questionnaires.

With all surveys, there is room for recall and response bias. It is difficult for respondents to accurately estimate the exact number of days they used the website. Most survey items were self report; participants may not report accurately. Those who volunteered for this intervention practice different habits than those who did not volunteer. The problem of recall bias can be addressed by using the measures discussed above.

Furthermore, there was no control, mostly due to study time frame and recruitment difficulties. The small sample size had some effect on the accuracy of normality tests and the strength of the p-value. This problem could be addressed by recruiting the sample from a larger population and beginning recruitment months in advance using incentives for every participant.

For future studies, an intervention utilizing a health website should be on a larger, less specific population during warmer months and away from holidays to get more significant results for both nutritional practices and physical activity.

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APPENDICES

APPENDIX A

THEORETICAL FIGURES

APPENDIX A

STAGES OF CHANGE THEORY

			Experiments with website/ small steps towards healthy lifestyle at home

Precontemplation – no intention of changing → **Contemplation** – problem recognition and contemplating change → **Preparation for Action**– intends to change within a month

Reads Informational Emails, Flyers, but has no intention of changing

Considering using website, seeks out info

Maintenance– maintains new behavior for 6 months or more ← **Action**– enacted consistent behavior for less than 6 months

Uses website for at least 6 months/ practices healthy lifestyle at home with or without website/ uses other means of healthy support

Consistently uses website for <6 months/ major steps towards healthy lifestyle at home

APPENDIX A

INTEGRATED THEORY OF HEALTH BEHAVIOR CHANGE

Integrated Theory of Health Behavioral Change

Knowledge and Beliefs– gain knowledge of appropriate caloric and fat intake through website, personal perceptions are changed about one's self, one's abilities, food choices and activity availabilities, goals become tangible

→

Self Regulation Skills and Ability – setting goals/group goals on website, monitor calorie intake and physical activity, plan ways to improve and evaluate success

←

Social Facilitation– gain social support through website, accountability, group goal setting, group encouragement, advice and positive influences from others

↓

Engagement in Self Management Behavior– utilization of diet diaries becomes easy, food judgment become second nature, healthy eating and physical exercise is habit and now a part of daily and social activities

↓

Health Status– lowered BMI, decreased cholesterol and fat intake, increased vitamin and nutrient intake, increased cardiovascular performance = lower risk of diabetes, hypertension, stroke, CHD, heart attack and numerous other diseases

APPENDIX A

THEORETICAL FRAMEWORK

```
┌──────────────┐              ┌──────────────┐              ┌──────────────┐
│  Pre - Test  │ ──────────►  │   6 week     │ ──────────►  │  Post - Test │
│              │              │ Intervention │              │              │
└──────────────┘              └──────────────┘              └──────────────┘
     /    \                                                      /    \
    /      \                                                    /      \
┌──────────┐   ┌──────────────┐                    ┌──────────┐   ┌──────────────┐
│NUTRITION │   │ PHYSICAL     │                    │NUTRITION │   │ PHYSICAL     │
│Stage of  │   │ ACTIVITY     │                    │Stage of  │   │ ACTIVITY     │
│Change    │   │ Stage of     │                    │Change    │   │ Stage of     │
│          │   │ Change       │                    │          │   │ Change       │
└──────────┘   └──────────────┘                    └──────────┘   └──────────────┘
```

APPENDIX B

VARIABLE KEY

Note: all pre-intervention variables have twin variable from Post Survey with "P" added to end of variable name.

Variable	Description	Coding				
name	first and last name					
healthwebuse	Have you ever used a health website before?	1 = yes	2= no			
Internetuse	self rated internet proficiency	1=excellent	2=good	3=average	4=poor	5=no use
fruit	servings ranging 0-?	continuous				
veg	servings ranging 0-?	continuous				
dairy	servings ranging 0-?	continuous				
grain	servings ranging 0-?	continuous				
protein	servings ranging 0-?	continuous				
NutStage	Nutritional Stage of Change	1 to 5				
WeeklyRPA	weekly regular physical activity - new variable	minutesXdays				
WeeklySPA	weekly strenuous physical activity - new variable	minutesXdays				
PAStage	Physical Activity Stage of Change	1 to 5 stages				
Sex	gender	1=male	0=female			
Age	age	continuous				
Classific	school classification	1=student	2=faculty	3=staff		
Academic	Academic Program	1=TCOM	2=SPH	3=GSBS	4=PA	5=other
height	height in inches	inches				
weight	weight in pounds	lbs				
BMI	calculated BMI	(Weight in Pounds / (Height in inches) x (Height in inches)) x 703				
Begin Post Intervention only variables						
DaysUse	How many days respondent logged onto Livestrong per week	ordinal				
DaysRNut	How many days respondent logged nutrition per week	ordinal				
DaysRPA	How many days respondent logged PA per week	ordinal				
Informed	Do you feel you are more informed about Nutrition and PA?	1=yes	0=no			
Motivation	Do you feel you have increased motivation for diet and exercise?	1=yes	0=no			
ImprovedNut	Do you feel you have improved your diet?	1=yes	0=no			
IncreasedPA	Do you feel you have improved your physical activity?	1=yes	0=no			
Continue	Will you continue to use Livestrong?	1=yes	0=no			
NutDiff	new variable in SAS Pre Nutrition SOC - Post Nutrition SOC	NutStage-NutstageP	ordinal change			
PADiff	new variable in SAS Pre physical activity SOC - Post physical activity SOC	Pastage-PAstageP	ordinal change			
BMIDiff	new variable in SAS Pre BMI - Post BMI	BMI-BMIP	ordinal change			
Age1	new variable in SAS, categorized age in to <30 and ≥ 30					
Internetuse1	new variable in SAS, categorized internetuse into Excellent and Good/Average					

APPENDIX C

NORMALITY FIGURES

APPENDIX C

TEST FOR NORMALITY ON NUTRITIONAL STAGE OF CHANGE

Test for Normality - Nutrition		
Test	**Alpha**	**P value**
Shapiro-Wilk	W= 0.835	0.0005
Anderson-Darling	A^2= 2.42	0.005

APPENDIX C

TEST FOR NORMALITY ON PHYSICAL ACTIVITY STAGE OF CHANGE

Test for Normality - Physical Activity		
Test	Alpha	P value
Shapiro-Wilk	W= .908	0.028
Anderson-Darling	A^2= 1.07	0.007

APPENDIX C

HISTOGRAM FOR NUTRITIONAL SOC SCORE DIFFERENCE
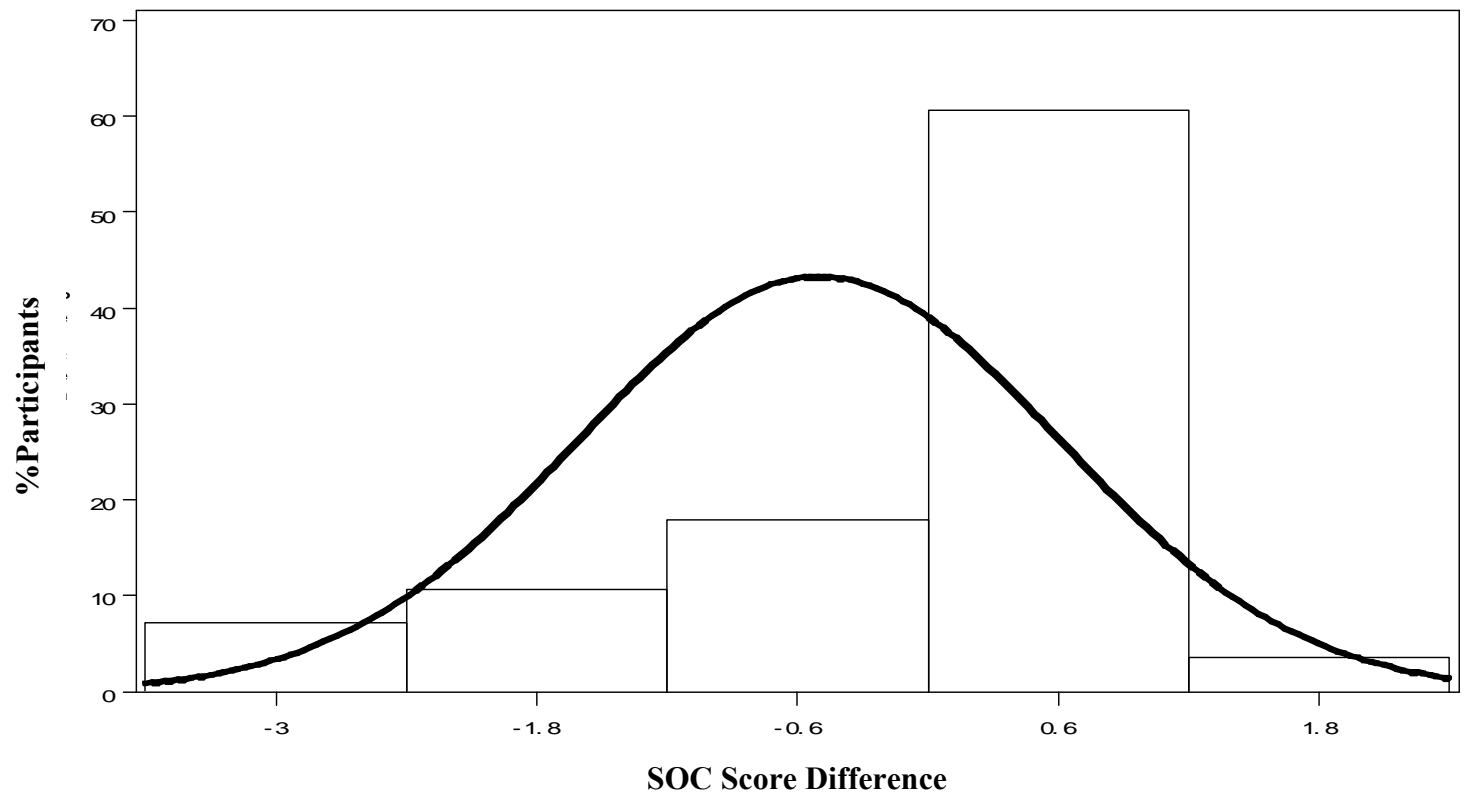
APPENDIX C

HISTOGRAM FOR PHYSICAL ACTIVITY SOC SCORE DIFFERENCE