

2012

THE EFFECT OF GOAL SETTING ON FRUIT AND VEGETABLE CONSUMPTION AND PHYSICAL ACTIVITY LEVEL IN A WEB- BASED INTERVENTION

Stephanie O'Donnell

University of Rhode Island, smod912@gmail.com

Follow this and additional works at: <http://digitalcommons.uri.edu/theses>

Terms of Use

All rights reserved under copyright.

Recommended Citation

O'Donnell, Stephanie, "THE EFFECT OF GOAL SETTING ON FRUIT AND VEGETABLE CONSUMPTION AND PHYSICAL ACTIVITY LEVEL IN A WEB-BASED INTERVENTION" (2012). *Open Access Master's Theses*. Paper 90.
<http://digitalcommons.uri.edu/theses/90>

This Thesis is brought to you for free and open access by DigitalCommons@URI. It has been accepted for inclusion in Open Access Master's Theses by an authorized administrator of DigitalCommons@URI. For more information, please contact digitalcommons@etal.uri.edu.

THE EFFECT OF GOAL SETTING ON FRUIT AND
VEGETABLE CONSUMPTION AND PHYSICAL
ACTIVITY LEVEL IN A WEB-BASED INTERVENTION

BY

STEPHANIE O'DONNELL

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
NUTRITION AND FOOD SCIENCES

UNIVERSITY OF RHODE ISLAND

2012

MASTER OF NUTRITION AND FOOD SCIENCES THESIS

OF

STEPHANIE O'DONNELL

APPROVED:

Thesis Committee:

Major Professor Geoffrey Greene, PhD, RD, LDN

Catherine English, PhD, RD, LDN

Bryan Blissmer, PhD

Nasser H. Zawia
DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND
2012

ABSTRACT

Background: Most people do not meet the recommendations for fruit and vegetable consumption and physical activity. Goal setting has been shown to increase health related behaviors such as these, but there has not been extensive research.

Objective: The purpose of this study was to explore the relationship between goal setting and fruit and vegetable consumption as well as physical activity to explore the relationship between goal setting and behavior in a web-based intervention for young adults.

Design: This study used a prospective, descriptive design using data from the Project WebHealth study, which used an experimental design. The intervention included ten online lessons that provided information about fruit and vegetable consumption and physical activity.

Participants/Setting: Participants (n=830) were from the experimental group of the original study. The study took place at 8 universities across the nation. Participants were 18 to 24 years (19.16 ± 1.15), mostly female (64%) and mostly white (79%).

Main outcome measures: Cups of fruits and vegetables and minutes of physical activity were reported online on a weekly basis along with weekly goal for 9 weeks.

Statistical analyses performed: ANOVAs were used to determine effects of time. Paired t-tests were used to explore the relationship between goals set and reported fruit and vegetable intake and physical activity. Meeting weekly goal was calculated and tertile of number of goals attained was used to determine goal group. ANCOVA assessed group effect. Chi-square was used to look at the association between group

and whether or not participants met recommendations for each behavior at the end of the intervention.

Results: There was a significant effect of goal setting on both fruit and vegetable consumption and physical activity. The effect was seen more clearly with fruit and vegetable consumption; the difference between goal and intake decreased over time, the correlation grew stronger, and the percent of subjects meeting or exceeding goals and percent of subjects meeting recommendations increased over time. For physical activity, the difference and correlation between goal and activity remained consistent throughout, the percent of subjects meeting or exceeding goals decreased over time with no significant change in percent of subjects meeting recommendations. There was a significant effect of goal group on meeting recommendations for both behaviors, which was stronger for fruit and vegetable consumption.

Conclusions: Goal setting as part of a web-based intervention was associated with an increase in fruit and vegetable consumption among young adults. While this study showed a significant effect of goal setting on physical activity, there were no increases in physical activity. Perhaps goal setting needs to be presented differently when trying to maintain versus change a behavior. There is a need for further research in this area, particularly with more reliable measures of intake and activity.

ACKNOWLEDGMENTS

I would like to thank my thesis committee for their patience and guidance throughout this process. Dr. English, Dr. Blissmer, and especially Dr. Greene – I couldn't have done this without you. I would also like to thank my family and friends for their unyielding support and motivation – you are my biggest reason for success. This thesis is dedicated to each and every person that has helped me to get where I am today.

PREFACE

This thesis was prepared in manuscript format following the author guidelines for the *Journal of the Academy of Nutrition and Dietetics*. After submitting this thesis, the manuscript may be submitted for publication.

TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
PREFACE.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	vii
MANUSCRIPT.....	1
ABSTRACT.....	2
INTRODUCTION.....	4
METHODS.....	7
RESULTS.....	12
DISCUSSION.....	15
TABLES.....	18
REFERENCES.....	23
APPENDICES.....	28
A. LITERATURE REVIEW.....	28
B. SELF-REPORT AND GOAL SETTING SCREEN.....	43
C. LINKED INFORMATION FROM LESSON 7.....	44
D. RELEVANT LESSON PAGES.....	48

LIST OF TABLES

TABLE	PAGE
Table 1. Subject baseline characteristics	18
Table 2. Weekly self-reported cups of fruits and vegetables consumption and goal set along with the relationship between them, percent meeting recommendations, and personal goal attainment	19
Table 3. Weekly self-reported minutes of physical activity done and goal set along with the relationship between them, percent meeting recommendations, and personal goal attainment	20
Table 4. Effect of goal group on fruit and vegetable intake and physical activity completed within subjects, adjusted for initial value	21
Table 5. Goal group by proportion of subjects meeting recommendations at week 10	22

MANUSCRIPT:

**“The Effect of Goal Setting on Fruit and Vegetable Consumption and Physical
Activity Level in a Web-based Intervention”**

By

Stephanie O’Donnell, RD, LDN

Prepared for submission to *Journal of the Academy of Nutrition and Dietetics*

ABSTRACT

Background: Most people do not meet the recommendations for fruit and vegetable consumption and physical activity. Goal setting has been shown to increase health related behaviors such as these, but there has not been extensive research.

Objective: The purpose of this study was to explore the relationship between goal setting and fruit and vegetable consumption as well as physical activity to explore the relationship between goal setting and behavior in a web-based intervention for young adults.

Design: This study used a prospective, descriptive design using data from the Project WebHealth study, which used an experimental design. The intervention included ten online lessons that provided information about fruit and vegetable consumption and physical activity.

Participants/Setting: Participants (n=830) were from the experimental group of the original study. The study took place at 8 universities across the nation. Participants were 18 to 24 years (19.16 ± 1.15), mostly female (64%) and mostly white (79%).

Main outcome measures: Cups of fruits and vegetables and minutes of physical activity were reported online on a weekly basis along with weekly goal for 9 weeks.

Statistical analyses performed: ANOVAs were used to determine effects of time. Paired t-tests were used to explore the relationship between goals set and reported fruit and vegetable intake and physical activity. Meeting weekly goal was calculated and tertile of number of goals attained was used to determine goal group. ANCOVA assessed group effect. Chi-square was used to look at the association between group

and whether or not participants met recommendations for each behavior at the end of the intervention.

Results: There was a significant effect of goal setting on both fruit and vegetable consumption and physical activity. The effect was seen more clearly with fruit and vegetable consumption; the difference between goal and intake decreased over time, the correlation grew stronger, and the percent of subjects meeting or exceeding goals and percent of subjects meeting recommendations increased over time. For physical activity, the difference and correlation between goal and activity remained consistent throughout, the percent of subjects meeting or exceeding goals decreased over time with no significant change in percent of subjects meeting recommendations. There was a significant effect of goal group on meeting recommendations for both behaviors, which was stronger for fruit and vegetable consumption.

Conclusions: Goal setting as part of a web-based intervention was associated with an increase in fruit and vegetable consumption among young adults. While this study showed a significant effect of goal setting on physical activity, there were no increases in physical activity. Perhaps goal setting needs to be presented differently when trying to maintain versus change a behavior. There is a need for further research in this area, particularly with more reliable measures of intake and activity.

INTRODUCTION

According to the Centers for Disease Control and Prevention (CDC), chronic diseases are the leading cause of death and disability in the United States, accounting for 7 out of 10 deaths each year and being among the most costly and preventable health problems (1). Americans have not been meeting recommendations for fruit and vegetable consumption and physical activity for years; inadequate performance of these health related behaviors are major contributors to chronic disease prevalence (2-6). Recent data show that the typical American diet meets less than half of the recommendations for fruit and vegetable consumption and less than half of adults meet the recommendations for physical activity (2,5). Among college students, data show that 5.8 percent consume 5 or more servings of fruits and vegetables daily and 21.5 percent do moderate-intensity physical activity on 5 or more days per week (7).

The low intake of fruits and vegetables and suboptimal physical activity levels of these young adults are alarming. Young adults are transitioning from parental control to becoming responsible for their selves and making independent decisions and establishing life structure (8). They are in the process of forming adult habits and thus effective interventions improving these behaviors in young adults may reduce the development of chronic disease in the future.

Interventions that include goal setting have been shown to have a positive effect on fruit and vegetable consumption and physical activity. Goal setting has been studied in relation to task performance and has been found to be effective in increasing performance (9-11). According to Locke and Latham, there are three mechanisms through which goals directly affect performance. These mechanisms are: (1) a

directive function (direct attention and effort toward goal-relevant activities and away from goal-irrelevant activities), (2) an energizing function (high goals lead to greater effort than low goals), (3) persistence (goals can prolong effort depending on difficulty level) (9, 12). Goals also indirectly affect performance by leading to arousal, discovery, and/or use of task-relevant information (13).

There are goal setting guidelines through which the chances of attaining a goal can be increased. For example, it has been consistently shown that setting a specific, difficult goal leads to higher performance than an ambiguous “do your best” goal (9). Falling under this umbrella would be S.M.A.R.T. goals, which this study used. S.M.A.R.T. goals are specific to a behavior, measurable, attainable, realistic, and time bound (14). Another way to increase the chances of goal attainment would be to use implementation intentions. Implementation intentions specify the when, where, and how so that when a situation arises, a person will know how to respond so that they can achieve goals (15).

A goal is the object or aim of an action, or a level of performance proficiency that we wish to attain, usually within a specified time frame (9,10). While there is a clear definition of what a goal is, there is variability as to how goals are set. They can be self-set, assigned, set participatively, or even guided (9,16). Due to this variability in guidelines for goal setting procedure, studies define goal setting in different ways. This could be one reason that some studies find goal setting to be an effective intervention while others do not (17-21).

Despite increasing evidence that goal setting has a positive effect on health related behaviors, there has been limited research on the effect of goal setting on fruit

and vegetable consumption and physical activity specifically and the research that has been done shows differing results. Studies by Sternfeld et al., Dishman et al., and Heneman et al. used goal setting as one component of an intervention and found significant increases in fruit and vegetable consumption and/or physical activity level (17-19). On the other hand, studies by Thorndike et al. and Latif et al. did not find goal setting to be an effective intervention (20-21). The research in these areas is even more limited for the young adult population. Due to this lack of extensive research, there is a need for studies that take a more in-depth look at the effects of goal setting in the areas of fruit and vegetable consumption and physical activity and among young adults.

The intervention for a study done by Greene et al. (Project WebHealth) was effective in increasing fruit and vegetable consumption and reducing decline in physical activity in college students (22) but the effect of goal setting was not assessed. The purpose of this study was to explore the relationship between goal setting and fruit and vegetable consumption as well as physical activity to see if there was a positive association between goal setting and behavior as part of a web-based intervention for young adults. The hypotheses for this study were as follows: cups of fruit and vegetables consumed and minutes of physical activity completed will increase over time with the use of weekly goal setting and by the end of the intervention subjects that are more effective goal achievers (meeting or exceeding the majority of the goals) will consume more fruits and vegetables and complete more physical activity than those that are not as effective goal achievers.

METHODS

DESIGN AND PARTICIPANTS

This study has a prospective, descriptive design. It is a secondary analysis of data from a previous research study (Project WebHealth), which used an experimental design with random assignment to groups (22). While the analysis of the data for this study took place at the University of Rhode Island, the data was collected from eight participating institutions around the country. The eight institutions are University of Maine, Michigan State University, The Pennsylvania State University, University of Rhode Island, South Dakota State University, Syracuse University, Tuskegee University, and University of Wisconsin - Madison. The data collection for Project WebHealth started in September 2007 and included a 3-month intervention period. Study participants were ages 18-24, had a BMI ≥ 18.5 , were not pregnant or breastfeeding, were not nutrition or exercise majors, and were without adverse health conditions. The subjects of this study are from the experimental group (n=830) of Project WebHealth, and are limited to those that completed the 10 online lessons included in the intervention and completed online weekly goals and behavior surveys for each area studied (fruit and vegetable consumption: n=724 (87%); physical activity: n=665 (80%)).

The intervention for Project WebHealth included 10 online lessons with facts, interactive questions, and personal feedback. Subjects were given access to one new lesson per week, and each lesson took approximately 15 minutes to complete. The 10 lessons were: (1) Getting Started, (2) Body Size Perceptions, (3) Hunger and Fullness, (4) Moving...to Good Health, (5) Skills to Fuel Your Body, (6) Moving...Your Way,

(7) Enhance Food Variety, (8) Being at Ease With Body Size, (9) Eating Enjoyment, and (10) Maintaining a Healthy Body Weight. At the end of each of the 10 lessons, subjects were asked to report their intake of fruits and vegetables in cups for the past week and set a goal for fruit and vegetable consumption in cups for the following week. In addition they were asked to report their performance of physical activity as number of days and minutes per day for the past week and set a goal for their physical activity in number of days and minutes per day for the following week. The exception to this goal setting was the final lesson, where the goal was for the next semester rather than the next week. These data are not reported in this study. The self-report and goal setting screens included a drop down menu with the following choices: less than ½ cup, ½ cup, 1 cup, 1 ½ cups, 2 cups, 2 ½ cups, 3 cups, 3 ½ cups, 4 cups, 4 ½ cups, or 5 cups or more of fruits and vegetables and 0, 1, 2, 3, 4, 5, 6, or 7 days of exercise with 10, 20, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, or 180+ minutes (on average) per day. In addition there was an option for don't know/not sure minutes of exercise (subjects choosing this option were excluded from exercise analyses). This weekly self-report and goal setting screen can be seen in Appendix B.

There were 4 lessons that included information about eating healthfully and 2 lessons including information about physical activity. In addition the first and last lessons included both behaviors. Only the relevant lessons will be described below. Lesson 1 included an overview of the lessons, provided information on how to set a S.M.A.R.T. goal, assessed current fruit and vegetable consumption, physical activity level, and allowed subjects to set goals for the following week. Although lessons 3, 7, and 9 were about eating, they did not include information that was specific to fruit and

vegetable consumption. The Dietary Guidelines, which include recommendations for fruit and vegetable consumption, were referenced in lesson 7, and the linked information can be seen in Appendix C. Lesson 5 included information on eating healthy, how to add and vary fruits and vegetables, tips for eating in dining halls and being flexible with meals, snack ideas, and benefits and reasons to eat healthy. Lesson 4 was about physical activity, and included benefits, recommendations, and tips for physical activity, along with examples of activity patterns and tips for dealing with barriers. Lesson 6 was also about physical activity, and included information on the importance of having fun, how different exercises have different effects, myths and facts of exercise, tips to stay motivated, and suggestions for physical activity. Finally, lesson 10 included a review of the lessons, assessment of S.M.A.R.T. goals, and a review of barriers to goals and tips to overcome them. The relevant pages from these lessons can be seen in Appendix D.

ANALYSES

All analyses were performed using SPSS (Version 20.0.0, SPSS, Inc.). Distributions of baseline characteristics were described using frequencies or means \pm SD. Weekly reported fruit and vegetable intake and goals were examined separately using repeated measures ANOVA with time as the within-subjects factor. Weekly reported fruit and vegetable intake was used to determine the percentage of subjects that were meeting recommendations for 5 or more cups of fruits and vegetables per day. A repeated measures ANOVA was then used to determine the effect of time on this proportion. A paired t-test was performed to determine the relationship between the goal that was set

for fruit and vegetable consumption one week and the reported intake for that week, which was reported the following week. This was repeated for all weeks containing both a goal and a reported intake. Goal attainment is defined as meeting or exceeding the goal that was set by the participant each week. This was determined for fruit and vegetable intake and frequency was used to obtain a percentage of subjects that achieved goal attainment, which was called personal goal attainment. These analyses were then repeated separately for reported physical activity completed and goal for physical activity with recommendations for 150 minutes of physical activity or more per week.

Following this, subjects were grouped by how many goals they met or exceeded. Each week, a goal attainment score was determined for both fruit and vegetable consumption and physical activity by whether or not the subject met or exceeded the goal that they set for that week. A total goal attainment score was then calculated by summation of the weekly goal attainment score in each area and subjects were divided into tertiles by this total score. There were a total of 9 goals set during the intervention. For fruit and vegetable consumption, goal group 1 met or exceeded 0 to 3 goals, goal group 2 met or exceeded 4 to 5 goals, and goal group 3 met or exceeded 6 or more goals. For physical activity, goal group 1 met 0 to 2 goals, goal group 2 met 3 to 4 goals, and goal group 3 met 5 or more goals. ANCOVAs were run separately for fruit and vegetable consumption and physical activity at week 10 looking at the effect of goal group with initial value as a co-variate. Chi square analyses were used to look at the association between goal group and whether or not subjects were meeting recommendations at week 10 separately for both fruit and

vegetable consumption and physical activity. Finally, a chi square analysis was done to determine if there was an association between those meeting recommendations at week 10 for fruit and vegetable consumption and those meeting recommendations at week 10 for physical activity.

RESULTS

A total of 830 subjects were assigned to the experimental group of the Project WebHealth study. Table 1 shows baseline characteristics. Of these subjects, 724 completed the ten online lessons, including weekly goal setting and self-reporting of cups of fruits and vegetables consumed. For physical activity, 665 subjects completed the ten online lessons, including weekly goal setting and self-reporting of minutes of physical activity completed (subjects choosing “don’t know/not sure” for minutes of exercise were considered non-completers for physical activity analyses).

Table 2 shows the relationship between the goal set for one week and the cups of fruits and vegetables that subjects reported that they consumed during that week. A significant effect was found ($p < .001$). The difference between the goal that was set and the reported cups of fruits and vegetables consumed appeared to decrease over time, going from -1.01 ± 1.19 to -0.25 ± 0.77 , and the correlation between the two appeared to grow stronger, going from .559 to .831. The percentage of subjects who met or exceeded the goal that they set for fruit and vegetable consumption trended upward over time. Although a drop was seen from week 1 to week 2, goal for fruit and vegetable consumption increased consistently over time from weeks 3-9 ($p < .001$). Reported fruit and vegetable intake and percentage of subjects meeting recommendations for fruit and vegetable consumption also increased over time ($p < .001$).

Table 3 shows the relationship between the goal set for one week and the minutes of physical activity that subjects reported during that week. A significant effect was found ($p < .001$). The difference between the goal that was set and the

reported minutes of physical activity completed appeared to increase overall throughout the intervention, going from -29.99 ± 104.93 to -38.48 ± 93.61 . The correlation between the goal that was set and the reported minutes of physical activity completed remained relatively consistent throughout the intervention, ranging from .842 to .875. The percentage of subjects who met or exceeded the goal that they set for physical activity had an overall trend downward over time. There was no increase seen in goal for physical activity, however there was a significant effect for time ($p < .001$). There was a slight decrease seen in reported physical activity completed and percentage of subjects meeting recommendations for physical activity but no significant effects were seen.

Table 4 shows the relationship between goal group and fruit and vegetable intake and physical activity completed at week 10 adjusted for initial value using ANCOVA. Goal group 3 (more effective goal achievers) consumed significantly more fruits and vegetables at week 10 than goal groups 1 and 2 ($F=65$, $p < .001$). Initial value had a significant effect on fruit and vegetable consumption at week 10 ($F=215$, $p < .001$). There was a significant difference for physical activity completed at week 10 between goal group 1 and goal group 3 ($F=7$, $p = .001$). Initial value had a significant effect on physical activity completed at week 10 ($F=450$, $p < .001$).

Table 5 shows the association between goal group and whether or not subjects were meeting recommendations for fruit and vegetable consumption and physical activity at week 10. This association was significant for fruit and vegetable consumption ($\chi^2=63.15$, $p < .001$) and for physical activity ($\chi^2=33.05$, $p < .001$). For fruit and vegetable consumption, only 1.9% of subjects in goal group 1 met

recommendations at week 10 while 3.9% of subjects in goal group 2 and 20.4% of subjects in goal group 3 did the same. For physical activity, only 28.1% of subjects in goal group 1 met recommendations at week 10 while 40.9% of subjects in goal group 2 and 57.3% of subjects in goal group 3 did the same.

The relationship between subjects that met recommendations at week 10 for both fruit and vegetable consumption and physical activity was examined but not included in the tables. There was no association found between meeting recommendations for both areas.

DISCUSSION

This study supports the hypothesis that fruit and vegetable consumption will increase over time with the use of weekly goal setting. It also supports the hypothesis that subjects that are more effective goal achievers will consume more fruits and vegetables than those that are not as effective goal achievers. Findings were not the same for physical activity. It is interesting that at the start of the intervention almost half of subjects were meeting recommendations for physical activity and only 3.1 percent were meeting recommendations for fruit and vegetable consumption. While this is consistent with the general population (3,6,7) it also suggests that goal setting may need to be framed differently for behaviors that are being maintained versus changed. This is supported by Thorndike et al. (20) who found no further increase in fruit and vegetable consumption or physical activity when goal setting was used as part of a maintenance intervention.

A similar study with a web-based intervention showed significant increases in both fruit and vegetable consumption and physical activity (17). The study, conducted by Sternfeld et al., used pre-set goals, which participants chose 1 to 2 of to work on per week. The assessments included both self-report of behaviors and a physical activity and diet questionnaire. Dishman et al. also found a significant increase in physical activity using both personal and team goal setting (18). The assessments done in this study included self-report, a physical activity questionnaire, and measured pedometer readings. It could be that a valid and reliable physical activity questionnaire or objective measures are able to more accurately capture the physical activity behavior as opposed to relying on self-report (23).

This study allowed subjects to choose their own goal from a drop down menu. This format does not allow for ensuring that participants were selecting a difficult goal and therefore goal setting is most likely having an effect via directive function. This is similar to other studies (17-21). The drop down menu is a limitation in this study because the goal options for physical activity far exceeded the recommendations whereas goal options for fruit and vegetable intake provided a maximum that was equal to recommendations. There was essentially one choice that met the goal for fruit and vegetable consumption (5 or more cups of fruits and vegetables per day). There were numerous combinations of number of days and minutes per day that met the recommendations for physical activity (150 minutes or more per week). The goal options for fruit and vegetable intake was based on prior research with this population (24-25) and only 3.1 percent of this sample reported an intake of 5 or more cups. Nevertheless, a different goal option format might have produced different results.

Subjects were divided into 3 goal groups in this study. These groups were based on whether or not subjects achieved the goals that they set. There was no information available as to how subjects chose a goal and whether or not they followed the S.M.A.R.T goal setting guidelines that were outlined for them (22). Presumably their goal setting reflected implementation intentions. Future studies should take a more in-depth look at the goal setting process, including how goals are set and what the mechanisms are being used.

Additional limitations besides the self-report and goal setting format described previously primarily reflect the sample. The sample was predominantly white college students enrolled in a health promotion study. Previous reports (22) found minimal

differences between experimental and control and the sample was reflective of the four-year college population (25). However, additional research is needed to generalize beyond this sample. Strengths of the study included the geographic diversity, large sample size and consistent data collection over a nine week period.

This study paves the way for future research. It is difficult to compare the results to other studies because there is limited research focused on the relationship between goal setting and fruit and vegetable consumption and physical activity among young adults, and because goal setting procedures are so variable. This study not only takes a more in-depth look at the relationship between goal setting and two very important health related behaviors, it shows success in increasing fruit and vegetable consumption and provides guidance for future studies to increase physical activity. It suggests that goal setting may be a cost-effective way to help prevent chronic diseases.

CONCLUSIONS

Goal setting as part of a web-based intervention can be effective in increasing fruit and vegetable consumption among young adults but results were less clear for physical activity. There is a need for further research in this area, particularly with more reliable measures of intake and activity. Goal setting may need to look different when exploring its relationship to maintain versus change a behavior.

Table 1: Subject Baseline Characteristics (N=830)	
Variable	Mean \pm SD
Age (y)	19.16 \pm 1.15
BMI*	23.70 \pm 3.83
	% with characteristic
Gender	
Male	36
Female	64
Race	
White	79
Black	11
Latino/Hispanic	3
American Indian/Alaskan Native	<1
Asian/Pacific Islander	6
Other	2
Year	
Freshman	33
Sophomore	37
Junior	29
Senior	<1
Residence	
On Campus	72
Off Campus	28
* Calculated as kg/m ²	

Table 2: Weekly self-reported cups of fruits and vegetables consumption and goal set along with the relationship between them, percent meeting recommendations, and personal goal attainment ^{a,b,c} (n=724)							
Reported Intake			Goal		Difference (Mean ± SD)	Correlation	Personal Goal Attainment ^d (%)
Week	Mean ± SD	Percent meeting recommendations for ≥ 5 cups of fruits and vegetables per day (%)	Week	Mean ± SD			
2	2.10 ± 1.30	3.1	1	3.11 ± 1.24	-1.01 ± 1.19***	.559***	28.9
3	2.22 ± 1.31	4.7	2	2.63 ± 1.24	-0.41 ± 0.86***	.772***	47.7
4	2.33 ± 1.32	4.3	3	2.73 ± 1.26	-0.40 ± 0.84***	.791***	50.6
5	2.44 ± 1.31	4.7	4	2.78 ± 1.27	-0.35 ± 0.83***	.792***	50.8
6	2.48 ± 1.33	5.9	5	2.87 ± 1.27	-0.39 ± 0.78***	.818***	49.2
7	2.59 ± 1.31	7.0	6	2.89 ± 1.27	-0.30 ± 0.80***	.810***	53.0
8	2.57 ± 1.37	7.9	7	2.94 ± 1.29	-0.37 ± 0.82***	.813***	52.3
9	2.58 ± 1.35	7.7	8	2.96 ± 1.30	-0.38 ± 0.77***	.830***	51.2
10	2.68 ± 1.33	8.4	9	2.93 ± 1.31	-0.25 ± 0.77***	.831***	58.0

***p<.001

^aChange in goal within subjects over time. F=32, p<.001, $\eta^2=0.04$

^bChange in reported cups of fruits and vegetables consumed within subjects over time. F=75, p<.001, $\eta^2=0.09$

^cChange in percentage of subjects meeting recommendations over time. F=10, p<.001, $\eta^2=0.01$

^dPersonal Goal Attainment = Percentage of subjects that met or exceeded their goal

Table 3: Weekly self-reported minutes of physical activity done and goal set along with the relationship between them, percent meeting recommendations, and personal goal attainment^a (n=665)

Reported Activity			Goal		Difference (Mean ± SD)	Correlation	Personal Goal Attainment ^b (%)
Week	Mean ± SD	Percent meeting recommendations for ≥ 150 minutes of physical activity per week (%)	Week	Mean ± SD			
2	198.77 ± 191.71	47.8	1	228.76 ± 179.19	- 29.99 ± 104.93***	.842***	43.2
3	198.11 ± 188.886	48.3	2	247.36 ± 189.01	-49.26 ± 95.75***	.872***	39.0
4	192.92 ± 184.68	46.1	3	239.50 ± 188.23	-46.59 ± 95.45***	.869***	41.1
5	194.83 ± 182.69	46.6	4	236.78 ± 184.96	-41.96 ± 91.85***	.875***	42.0
6	192.59 ± 189.85	44.6	5	234.69 ± 189.71	-42.10 ± 102.27***	.855***	42.7
7	196.55 ± 189.23	47.1	6	238.04 ± 192.22	-41.49 ± 97.03***	.871***	42.7
8	188.08 ± 185.46	46.4	7	236.39 ± 193.94	-48.32 ± 105.13***	.847***	40.7
9	184.82 ± 187.44	44.1	8	227.84 ± 194.15	-43.02 ± 102.14***	.857***	42.6
10	185.71 ± 183.06	45.1	9	224.19 ± 184.91	-38.48 ± 93.61***	.871***	33.8

***p<.001

^aChange in goal within subjects over time. F=5, p<.001, $\eta^2=0.01$

^bPersonal Goal Attainment = Percentage of subjects that met or exceeded their goal

Table 4: Effect of goal group on fruit and vegetable intake and physical activity completed within subjects, adjusted for initial value ^{a,b,c,d,e}			
Fruit and Vegetable Intake (n=724)		Physical Activity Completed (n=558)	
Goal Group ^f	Cups Consumed at Week 10 (Mean ± SE)	Goal Group ^g	Minutes Completed at Week 10 (Mean ± SE)
1	2.32 ± 0.07 ¹	1	149.34 ± 9.11 ¹
2	2.60 ± 0.07 ¹	2	162.67 ± 9.21 ^{1,2}
3	3.17 ± 0.07 ²	3	197.04 ± 9.26 ²

^aEffect of goal group on fruit and vegetable consumption at week 10. $F_{(2,720)}=37$, $p<.001$, $\eta^2=0.09$

^bEffect of goal group with goal groups 1 and 2 combined on fruit and vegetable consumption at week 10. $F=65$, $p<.001$, $\eta^2=0.08$

^cEffect of initial value on fruit and vegetable consumption at week 10. $F_{(1,723)}=215$, $p<.001$, $\eta^2=0.23$

^dEffect of goal group on physical activity completed at week 10. $F_{(2,554)}=7$, $p=.001$, $\eta^2=0.02$

^eEffect of initial value on physical activity completed at week 10. $F_{(1,557)}=450$, $p<.001$, $\eta^2=0.46$

^fFor fruit and vegetable intake: goal group 1 met 0-3 goals, goal group 2 met 4-5 goals, goal group 3 met 6 or more goals

^gFor physical activity: goal group 1 met 0-2 goals, goal group 2 met 3-4 goals, goal group 3 met 5 or more goals

Table 5: Goal group by proportion of subjects meeting recommendations at week 10^{a,b,c,d}

Subjects with fruit and vegetable intake meeting recommendations at week 10 (n=724)				Subjects with physical activity completed meeting recommendations at week 10 (n=558)			
Goal Group ^e	No	Yes	Total	Goal Group ^f	No	Yes	Total
1	255 (98.1%)	5 (1.9%)	35.9%	1	138 (71.9%)	54 (28.1%)	34.4%
2	220 (96.1%)	9 (3.9%)	31.6%	2	107 (59.1%)	74 (40.9%)	32.4%
3	187 (79.6%)	48 (20.4%)	32.5%	3	79 (42.7%)	106 (57.3%)	33.2%

^aRecommendations for fruit and vegetable consumption: ≥ 5 cups per day

^bRecommendations for physical activity: ≥ 150 minutes per day

^cAssociation of goal group with meeting fruit and vegetable recommendations at week 10. $\chi^2_{(2df)}=63.15, p<.001$

^dAssociation of goal group with meeting physical activity recommendations at week 10. $\chi^2_{(2df)}=33.05, p<.001$

^eFor fruit and vegetable intake: goal group 1 met 0-3 goals, goal group 2 met 4-5 goals, goal group 3 met 6 or more goals

^fFor physical activity: goal group 1 met 0-2 goals, goal group 2 met 3-4 goals, goal group 3 met 5 or more goals

REFERENCES

1. Centers for Disease Control and Prevention. Chronic disease prevention and health promotion. <http://www.cdc.gov/nccdphp>. Accessed November 9, 2012.
2. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans (7th Edition). Washington, DC: U.S. Government Printing Office, December 2010.
3. Blanck HM, Gillespie C, Kimmons JE, Seymour JD, & Serdula MK. Trends in fruit and vegetable consumption among U.S. men and women, 1994-2005. *Preventing Chronic Disease*. 2008;5(2).
4. U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. <http://www.health.gov/paguidelines/>. Accessed November 9, 2012

5. Centers for Disease Control and Prevention. Facts about physical activity.
<http://www.cdc.gov/physicalactivity/data/facts.html>. Accessed November 9, 2012.
6. Centers for Disease Control and Prevention . U.S. physical activity statistics.
<http://apps.nccd.cdc.gov/PASurveillance/StateSumV.asp>. Accessed November 9, 2012.
7. American College Health Association. American College Health Association-National College Health Assessment II: Undergraduate reference group executive summary spring 2012. Hanover, MD: American College Health Association; 2012.
8. Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*. 2000;55(5):469-480.
9. Locke EA & Latham GP. Building a practically useful theory of goal setting and task motivation. *American Psychologist*. 2002;57(9):705-717.
10. Latham GP & Locke EA. Enhancing the benefits and overcoming the pitfalls of goal setting. *Organizational Dynamics*. 2006;35(4):332-340.
11. Latham GP & Locke EA. New developments in and directions for goal-setting research. *European Psychologist*. 2007;12(4):290-300.

12. LaPorte R & Nath R. Role of performance goals in prose learning. *Journal of Educational Psychology*. 1976;68:260-264.
13. Wood R & Locke E. Goal setting and strategy effects on complex tasks. *Research in Organizational Behavior*. 1990;12:73-109.
14. Cothran HM and Wysocki AF. Developing SMART goals for your organization. University of Florida IFAS Extension. <http://edis.ifas.ufl.edu/fe577>. Published October 2005. Revised December 2008. Accessed December 2012.
15. Gollwitzer PM. Implementation intentions strong effects of simple plans. *American Psychologist*. 1999;54(7):493-503.
16. Shilts MK, Horowitz M, & Townsend MS. An innovative approach to goal setting for adolescents: guided goal setting. *Journal of Nutrition Education and Behavior*. 2004;36:155-156.
17. Sternfeld B, Block C, Quesenberry CP Jr., et al. Improving diet and physical activity with ALIVE a worksite randomized trial. *American Journal of Preventive Medicine*. 2009;36(6):475-483.

18. Dishman RK, DeJoy DM, Wilson MG, & Vanderberg RJ. Move to improve: A randomized workplace trial to increase physical activity. *American Journal of Preventive Medicine*. 2009;36(2):133-141.
19. Henemen K, Block-Joy A, Zidenberg-Cherr S, et al. A “contract for change” increases produce consumption in low-income women: A pilot study. *Journal of the American Dietetic Association*. 2005;105(11):1793-1796.
20. Thorndike AN, Sonnenberg L, Healey E, Myint-U K, Kvedar JC, & Regan S. Prevention of weight gain following a worksite nutrition and exercise program: A randomized controlled trial. *American Journal of Preventive Medicine*. 2012; 43(1):27-33.
21. Latif H, Watson K, Nguyen N, et al. Effects of goal setting on dietary and physical activity changes in the boy scout projects. *Health Education & Behavior*. 2011;38(5):521-529.
22. Greene GW, White AA, Hoerr SL, et al. Impact of an online healthful eating and physical activity program for college students. *American Journal of Health Promotion*. 2012;27(2):47-58.

23. Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*. 2003;35:1381–1395.
24. Park A, Nitzke S, Kritsch K, et al. Internet- based interventions have potential to affect short-term mediators and indicators of dietary behavior of young adults. *Journal of Nutrition Education and Behavior*. 2008;40:288–297.
25. American College Health Association– National College Health Assessment spring 2007 reference group data report (abridged). *Journal of American College Health*. 2008;56:469– 479.

APPENDICES

A. LITERATURE REVIEW

Chronic disease is a growing problem in the United States. According to the Centers for Disease Control and Prevention (CDC), chronic diseases are the leading cause of death and disability in the United States, accounting for 7 out of 10 deaths each year and being among the most costly health problems (Centers for Disease Control and Prevention [CDC], 2012a). Along with being costly, chronic diseases are also preventable (CDC, 2012a). The dietary and physical activity habits of Americans are major contributing factors to this problem and they need to be changed.

The Dietary Guidelines 2010 contain a focus on increasing fruit and vegetable consumption due to their association with reduced risk of chronic disease (U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services [HHS], 2010). Recommendations for intake for adults are two or more fruits and 3 or more vegetables daily from the Dietary Guidelines, and one and a half to two cups of fruit and two to three cups of vegetables daily from the USDA (based on age, sex, and physical activity level) (USDA & HHS, 2010; USDA, 2011a; USDA, 2011b). Most Americans do not meet these recommendations and have not in some years. The typical American diet meets about 42 percent of the goal for fruit and 59 percent of the goal for vegetables (USDA & HHS, 2010), and the proportion of people consuming fruits or vegetables five or more times per day went from 20.6 percent to 20.3 percent

among men and 28.4 percent to 29.6 percent among women from 1994 to 2005 (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008).

The 2008 Physical Activity Guidelines for Americans recommend that adults ages 18 to 64 do 2 hours and 30 minutes of moderate-intensity physical activity or 1 hour and 15 minutes of vigorous-intensity physical activity per week in order to obtain health benefits, including reduced risk of many chronic diseases (HHS, 2008). Consistent with this, the American College of Sports Medicine and the American Heart Association recommend 30 minutes of moderate-intensity physical activity at least 5 days per week or 150 minutes per week of moderate-intensity physical activity (American College of Sports Medicine, 2012; American Heart Association, 2012). According to the CDC, only 48 percent of adults meet the recommendations stated in the 2008 Physical Activity Guidelines of Americans (CDC, 2012b). This percentage has not changed much over the past decade. Data from the Behavioral Risk Factor Surveillance System show that 48.8 percent of people met physical activity recommendations in 2007, a slight increase from 48.1 percent in 2005, 45.9 percent in 2003, and 45.3 percent in 2001 (CDC,2010).

Young adults are an especially important part of the future and it is concerning that the majority do not meet recommendations for fruit and vegetable consumption and physical activity. Data collected in Spring 2012 show only 5.8 percent of college students eating 5 or more servings of fruits and vegetables per day, along with 21.5 percent doing moderate-intensity exercise at least 5 days per week (American College Health Association [ACHA], 2012a). Although this is a slight increase from Fall 2011, it is still not enough (ACHA, 2012b). It is important to focus on these health

related behaviors during this time period because it is during these early adult years that people are forming lifetime habits. During the late teens through early twenties, people are going through major changes, including transitioning to becoming responsible for their selves and making independent decisions and establishing life structure (Arnett, 2000). Effective interventions improving these behaviors in young adults may reduce the development of chronic disease in the future.

One technique that has been shown to increase health related behaviors is goal setting. Goal setting has shown promise as a useful, cost-effective, and empowering tool in previous studies and can easily be incorporated by a number of professionals (Pearson, 2012). Research shows that goal setting can increase performance on over 100 tasks in a variety of settings (Locke & Latham, 2002). Interestingly, the effectiveness of goal setting for dietary and physical activity behavior change has been shown more for adults and less for adolescents (Shilts, Horowitz, & Townsend, 2004). There has also not been extensive research on goal setting during the transition period from adolescence to adulthood.

Research on goal setting has been going on for years, but increased in both quality and quantity during the latter half of the 20th century. Locke and Latham developed a goal-setting theory, which states that there is a positive linear relationship between a specific high goal and task performance (Latham & Locke, 2007). A goal is defined as the object or aim of an action or a level of performance proficiency that we wish to attain, usually within a specified time frame (Latham & Locke, 2006; Locke & Latham, 2002). The research initially done on this topic focused on

organizational or work-related tasks (Locke & Latham, 2002) but later expanded into health related behavior change.

Goal setting falls under several theories of behavior change, including the Cognitive Behavioral Theory (CBT) and the Social Cognitive Theory (SCT). The CBT induces change by utilizing a directive, action-oriented approach that teaches a person to explore, identify, and analyze dysfunctional patterns of thinking (Saphn et al., 2010). The SCT induces change by using four conditions (attention, retention, motor reproduction, and motivation) to help people learn from others (Saphn et al., 2010). The separation of goal-setting theory from the theories of behavior change that it falls under is rooted in its focus on the core properties of an effective goal. This includes specificity and difficulty level and moderators of goal effects (goal commitment, goal importance, self-efficacy, feedback, and task complexity), among others (Locke & Latham, 2002).

According to Locke and Latham, there are three mechanisms through which goals directly affect performance. These mechanisms are: (1) a directive function (direct attention and effort toward goal-relevant activities and away from goal-irrelevant activities), (2) an energizing function (high goals lead to greater effort than low goals), (3) persistence (goals can prolong effort depending on difficulty level) (Locke & Latham, 2002; LaPorte & Nath, 1976). Goals also indirectly affect performance by leading to arousal, discovery, and/or use of task-relevant information (Wood & Locke, 1990).

There are goal setting guidelines through which the chances of attaining a goal can be increased. For example, it has been consistently shown that setting a specific,

difficult goal leads to higher performance than an ambiguous “do your best” goal (Locke & Latham, 2002). Falling under this umbrella would be S.M.A.R.T. goals. S.M.A.R.T. goals are specific to a behavior, measurable, attainable, realistic, and time bound. Another way to increase the chances of goal attainment would be to use implementation intentions. Implementation intentions specify the when, where, and how so that when a situation arises, a person will know how to respond so that they can reach goal attainment (Gollwitzer, 1999).

Goals can be self-set, assigned, or set participatively (Locke & Latham, 2002). There has also been some research on guided goal setting where someone chooses a goal from a variety of goals that were already created by someone else (Shilts et al., 2004). Regardless of how goals are set, there have been thousands of studies conducted all over the world that show their effectiveness in increasing a person’s performance (Latham & Locke, 2006; Locke & Latham, 2002). Although the reasons for the effectiveness of goal setting are not one hundred percent clear, there are several things that might contribute. Some of these contributors could be: discovery of sub-par performance, focused attention on goal-related behaviors, and an objective, unambiguous way to judge effectiveness (Latham & Locke, 2006).

Some studies have looked at goal setting as part of a web-based intervention. Web-based interventions can be tailored to individuals and offered at a relatively low cost, along with the option of wide distribution (Broekhuizen, Kroeze, van Poppel, Oenema & Brug, 2012). With the ever-growing use of computers and the Internet, web-based interventions coincide with advances in technology and today’s society.

Studies have shown this method of delivery to be effective with both dietary and physical activity interventions (Broekhuizen et al., 2012).

Goal setting has been shown to be effective in both web-based and other types of interventions. In a previous review (Cullen, Baranowski, & Smith, 2001), it was noted that there is a great amount of variability across studies related to what and how goal setting procedures were used. Table 1 shows selected studies that look at the effect of goal setting on fruit and vegetable consumption and/or physical activity. Most of these studies provide little detail on goal setting procedures used. One of the studies shown is focused on an internet-based, worksite intervention to prevent weight gain which used goal setting as part of the chosen intervention (Thorndike, Sonnenberg, Healey, Myint-U, Kvedar & Regan, 2012). Another study is focused on finding an intervention that can reach large segments of the population to improve diet and physical activity and again used goal setting as part of the chosen intervention (Sternfeld et al., 2009). Other studies focus on goal setting, but look at it in relation to different populations, such as male children (Latif et al., 2011), adults (Dishman, DeJoy, Wilson & Vanderberg, 2009), or women (Heneman et al., 2005).

Results from the studies shown in Table 1 vary. While some show significant increases in physical activity and fruit and vegetable consumption (Sternfeld et al., 2009; Dishman et al., 2009; Heneman et al., 2005) and one suggests a positive relationship between goal setting and healthy eating and physical activity (Kelley & Abraham, 2004), others show no effect of goal setting (Thorndike et al., 2012; Latif et al., 2011). None of these studies focus on the important population of young adults. Despite increasing evidence that goal setting has a positive effect on health related

behaviors, there is limited research on the effect of goal setting on fruits and vegetables and physical activity specifically. Due to this lack of extensive research, there is a great need for studies that take a more in-depth look at the effects of goal setting in the area of fruit and vegetable consumption and physical activity and among young adults.

Table 1: Description of studies that include goal setting in relation to fruit and vegetable consumption (FV) and/or physical activity (PA)

Authors (date)	Design/Criteria and Timeline	Purpose	Intervention	Results
Thorndike et al. (2012)	<ul style="list-style-type: none"> • Employees from Mass. General Hospital • Must have enrolled in "Be Fit" program between March 2008- Dec. 2008 • Not Pregnant or planning to leave employer within 3 months of program • n=302 (157 intervention; 145 control) • Assessments at baselines, 10 weeks, 1 year 	To test the efficacy of a 9-month Internet-based intervention to prevent weight gain immediately following the 10-week nutrition and exercise program	<ul style="list-style-type: none"> • Random assignment • Goals set every 3 months • Weekly PA goals: amount of time doing aerobic exercise, number of strength workouts, & average daily pedometer steps • Weekly FV goal: number of food logs aimed to complete • Feedback provided online weekly • Option for personal contact every 3 months (individual) • Assessments included: (PA) time spent/week during past 3 months walking or running, other aerobic exercise, or lower-intensity exercise, average flight of stairs climbed/day, & normal walking pace; (FV) number of times/day over the past month that fruits and vegetables were eaten 	<ul style="list-style-type: none"> • All subjects improved nutrition and exercise behaviors • FV consumption increased • PA increased • No group effect • 9-month maintenance intervention immediately following 10-week program did not improve 1-year outcomes more than usual care
Latif et al. (2011)	<ul style="list-style-type: none"> • Secondary Analysis • Boy Scouts in greater Houston area during Spring or Fall 2003 • n=473 • Assessments at baseline, immediate posttest, 6 months posttest 	To evaluate the relationship between goal setting and diet and physical activity behavior and to examine whether home availability or preferences moderated the effects of goal setting	<ul style="list-style-type: none"> • Two-group design: PA or FV with random assignment • Weekly in-troop activities and Internet activities • Goals set initially and gradually increased every week: number of FV servings and minutes of PA • Goal attainment (or not) reported weekly online • Assessments included: (FV) modified FFQ; (PA) monitored with MTI® accelerometer for 3 days 	<ul style="list-style-type: none"> • Goal setting not related to low-fat vegetable intake or physical activity and complexly related to fruit juice intake • Goal enhancing effects were mostly short term

Table 1 (continued)				
Authors (date)	Design/Criteria and Timeline	Purpose	Intervention	Results
Sternfeld et al. (2009)	<ul style="list-style-type: none"> • Employees of Northern California Kaiser Permanente • No exclusion criteria • n=787 • Assessments: pre-intervention, immediate post-intervention, 4-month post-intervention 	To determine whether ALIVE achieved increases in the consumption of fruits and vegetables and physical activity and decreases the consumption of saturated fats, trans fats, and added sugars	<ul style="list-style-type: none"> • RCT with random assignment • Emails sent to participant over 16 weeks (weekly for first 2 months, bi-weekly for next 2 months) and include 4 to 6 individually tailored, small-step goals of which the participant chooses 1 or 2 per week • No contact for control • Assessments included: (PA) total MET-minutes/week, minutes of moderate PA/week, minutes of vigorous PA/week, minutes of walking/week, minutes of sedentary behavior/week; (FV) cup equivalents of FV per day • Also included PAQ and diet questionnaire 	<ul style="list-style-type: none"> • Significant increase in MET-minutes/week, moderate and vigorous PA, and walking • Significant decrease in sedentary behavior • Significant increase in consumption of FV • Changes were sustained 4 months post intervention
Dishman et al. (2009)	<ul style="list-style-type: none"> • Employees of The Home Depot from 20 diverse regions of the U.S. • No overt cardiovascular, pulmonary, or metabolic disease • n=965 (664 intervention; 301 control) • Assessments: baseline, mid-point, post-test 	To increase physical activity using individual goal setting with a social-ecologic model including management endorsement, employee-management steering committees, group and organizational goal setting, and environmental prompts	<ul style="list-style-type: none"> • Random assignment • Personal goals and team goals • Personal goals evaluated and adjusted bi-weekly by participants • Team goals based on attainment of personal goals • Assessment: IPAQ, record of 10-minute blocks of MVPA and daily pedometer steps 	<ul style="list-style-type: none"> • Linear increases in moderate and vigorous PA and walking in intervention group • Linear increase in walking in control group • Goal-setting is useful to attain increased PA

Table 1 (continued)				
Heneman et al. (2005)	<ul style="list-style-type: none"> English-speaking low-income women Ages 20-45 years No chronic disease or pregnancy n=65 Assessments: pre-intervention, post-intervention, 1-month post-intervention 	To determine the effectiveness of pairing personalized goal-setting exercises within community-based nutrition education programs to promote behavior change in a low-income population	<ul style="list-style-type: none"> Random assignment Control, Education, and Contract groups Contract group: Contract for Change at first meeting with goal reminders in subsequent classes, along with education Assessment: Food Behavior Checklist, FFQ 	<ul style="list-style-type: none"> Contract group showed significant increase in fruit consumption from baseline to final time points compared to education Contract group trended toward increased vegetable consumption
Kelley & Abraham (2004)	<ul style="list-style-type: none"> Out-patient clinic attendees Ages over 65 years Must have telephone access and no difficulty using it Not living in nursing or residential home No cognitive impairment n=252 (125 intervention; 127 control) Assessments: pre-intervention and 2-weeks post-intervention 	To evaluate the effectiveness of a booklet promoting healthy eating and increased PA amongst people over 65 years, attending hospital out-patient clinics	<ul style="list-style-type: none"> Random assignment Intervention group received Healthy Living Booklet which encouraged goal setting, asked to complete daily Assessment: perceived behavioral control, intentions for behavior, self-assessed behavior 	<ul style="list-style-type: none"> Suggests that gains in healthy eating and physical activity may be due to the intervention prompting goal setting Participants judged themselves as more successful with healthy eating vs. PA

REFERENCES

- American College Health Association (2012a). *American College Health Association-National College Health Assessment II: Undergraduate reference group executive summary fall 2011*. Hanover, MD: American College Health Association; 2012.
- American College Health Association (2012b). *American College Health Association-National College Health Assessment II: Undergraduate reference group executive summary spring 2012*. Hanover, MD: American College Health Association; 2012.
- American College of Sports Medicine (2012). *ACSM, AHA Support Federal Physical Activity Guidelines*. Retrieved from : <http://www.acsm.org/about-acsm/media-room/acsm-in-the-news/2011/08/01/acsm-aha-support-federal-physical-activity-guidelines>
- American Heart Association (2012). *American Heart Association Guidelines for Physical Activity*. Retrieved from:
http://www.heart.org/HEARTORG/GettingHealthy/PhysicalActivity/StartWalking/American-Heart-Association-Guidelines-for-Physical-Activity_UCM_307976_Article.jsp
- Arnett, J.J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, 55(5), 469-480.

- Blanck, H.M., Gillespie, C., Kimmons, J.E., Seymour, J.D., & Serdula, M.K. (2008). Trends in fruit and vegetable consumption among U.S. men and women, 1994-2005. *Preventing Chronic Disease, 5*(2).
- Broekhuizen, K., Kroeze, W., van Poppel, M.N.M., Oenema, A., & Brug, J. (2012). A systematic review of randomized controlled trials on the effectiveness of computer-tailored physical activity and dietary behavior promotion programs: an update. *Annals of Behavioral Medicine, 44*, 259-286.
- Centers for Disease Control and Prevention (2010). *U.S. physical activity statistics*. Department of Health and Human Services. Retrieved from:
<http://apps.nccd.cdc.gov/PASurveillance/StateSumV.asp>
- Centers for Disease Control and Prevention (2012a). *Chronic disease prevention and health promotion*. Department of Health and Human Services. Retrieved from:
<http://www.cdc.gov/nccdphp>
- Centers for Disease Control and Prevention (2012b). *Facts about physical activity*. Department of Health and Human Services. Retrieved from:
<http://www.cdc.gov/physicalactivity/data/facts.html>
- Cullen, K.W., Baranowski, T., & Smith, S.P. (2001). Using goal setting as a strategy for dietary behavior change. *Journal of the American Dietetic Association, 101*(5), 562-566.
- Dishman, R.K., DeJoy, D.M., Wilson, M.G., & Vanderberg, R.J. (2009). Move to improve: A randomized workplace trial to increase physical activity. *American Journal of Preventive Medicine, 36*(2), 133-141.

- Gollwitzer, P.M. (1999). Implementation intentions strong effects of simple plans.”
American Psychologist, 54(7), 493-503.
- Henemen, K., Block-Joy, A., Zidenberg-Cherr, S., Donohue, S., Garcia, L., Martin, A. ...Steinberg, F.M. (2005). A “contract for change” increases produce consumption in low-income women: A pilot study. *Journal of the American Dietetic Association*, 105(11), 1793-1796.
- Kelley, K. & Abraham, C. (2004). RCT of a theory-based intervention promoting healthy eating and physical activity amongst out-patients older than 65 years. *Social Science and Medicine*, 59(4), 787-797.
- Latham, G.P. & Locke, E.A. (2006). Enhancing the benefits and overcoming the pitfalls of goal setting. *Organizational Dynamics*, 35(4), 332-340.
- Latham, G.P. & Locke, E.A. (2007). New developments in and directions for goal-setting research. *European Psychologist*, 12(4), 290-300.
- Latif, H., Watson, K., Nguyen, N., Thompson, D., Baranowski, J., Jago, R. ...Baranowski, T. (2011). Effects of goal setting on dietary and physical activity changes in the boy scout projects. *Health Education & Behavior*, 38(5), 521-529.
- LaPorte, R. & Nath, R. (1976). Role of performance goals in prone learning. *Journal of Educational Psychology*, 68, 260-264.
- Locke, E.A. & Latham, G.P. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist*, 57(9), 705-717.
- Pearson, E. (2012). Goal setting as a health behavior change strategy in overweight and obese adults: A systemic literature review examining intervention components. *Patient Education and Counseling*, 87, 32-42.

- Saphn, J.M., Reeves, R.S., Keim, K.S., Laquatra, I., Kellogg, M., Jortberg, B., Clark, N.A. (2010). State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change. *Journal of the American Dietetic Association, 110*(6), 879-891.
- Shilts, M.K., Horowitz, M., & Townsend, M.S. (2004). An innovative approach to goal setting for adolescents: guided goal setting. *Journal of Nutrition Education and Behavior, 36*, 155-156.
- Sternfeld, B., Block, C., Quesenberry, C.P. Jr., Block, T.J., Husson, G., Norris, J.C. ...Block, G. (2009). Improving diet and physical activity with ALIVE a worksite randomized trial. *American Journal of Preventive Medicine, 36*(6), 475-483.
- Thorndike, A.N., Sonnenberg, L., Healey, E., Myint-U, K., Kvedar, J.C., & Regan, S. (2012). Prevention of weight gain following a worksite nutrition and exercise program: A randomized controlled trial. *American Journal of Preventive Medicine, 43*(1), 27-33.
- U.S. Department of Agriculture and U.S. Department of Health and Human Services. (2010). *Dietary Guidelines for Americans* (7th Edition). Washington, DC: U.S. Government Printing Office, December 2010.
- U.S. Department of Agriculture (2011a). *How much fruit is needed daily*. Retrieved from: http://www.choosemyplate.gov/food-groups/fruits_amount_table.html
- U.S. Department of Agriculture (2011b). *How many vegetables are needed daily or weekly*. Retrieved from: http://www.choosemyplate.gov/food-groups/vegetables_amount_table.html

- U.S. Department of Health and Human Services (2008). *2008 Physical Activity Guidelines for Americans*. Retrieved from: <http://www.health.gov/paguidelines/>
- Wood, R., & Locke, E. (1990). Goal setting and strategy effects on complex tasks. *Research in Organizational Behavior*, *12*, 73-109.

B. SELF-REPORT AND GOAL SETTING SCREEN



Now Examine and Set Your Fruit and Vegetable and Physical Activity Goals for the Week

Your profile page will keep track of your goal setting. **YOUR GRAPHS ARE NOT AVAILABLE TO THE GENERAL PUBLIC.** Your tracking graphs are for your own use only.

The 2005 US Dietary Guidelines define a cup of fruit or vegetables as 1 cup of cooked or raw vegetables, 2 cups of lettuce, 1 cup cooked or raw fruit, a piece of fruit, 1/2 cup of dried fruit like raisins, or 1 cup (8 ounces) of 100% fruit juice. Remember that combination foods such as pizza, spaghetti, and soup usually contain fruits and/or vegetables so don't forget to count them!

Now, to the best of your ability, answer the questions below.

Last Week...

1) how many cups of fruits and vegetables **a day** did you usually eat?

2) how many **days** did you exercise?

3) How many **minutes** (on average) did you exercise on those days?

This Week...

1) how many cups of fruits and vegetables **a day** do you intend to eat?

2) how many **days** do you plan to exercise?

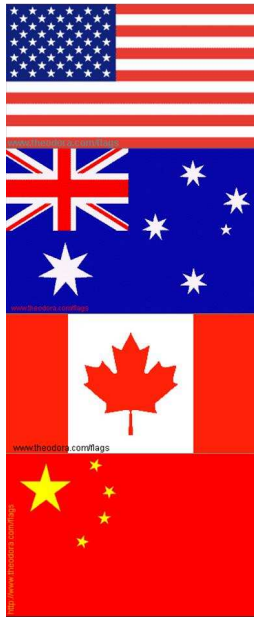
3) How many **minutes** (on average) will you spend exercising on those days?

C. LINKED INFORMATION FROM LESSON 7

Enhance Food Variety: Lesson 7

Dietary Guidelines from Around the World

Click on USA to read about the dietary guidelines for Americans. Then explore how the dietary guidelines for other countries differ.



USA

Australia

Canada

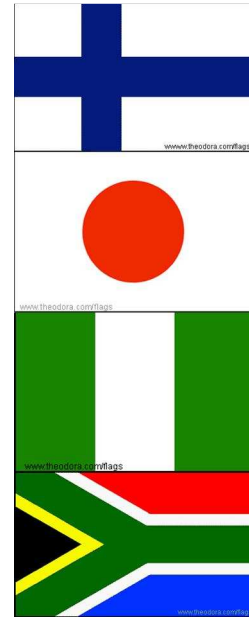
China

Finland

Japan

Nigeria

South Africa



[<< Previous Page](#)

[Next Page >>](#)

United States

The United States dietary guidelines suggests that nutrient needs should be met primarily through the consumption of foods. The recommendations are meant for Americans over 2 years of age. Key recommendations include consuming a **variety** of nutrient-dense foods and beverages within the basic food groups while choosing foods that limit the intake of saturated fat and trans fat, cholesterol, added sugars, salt, and alcohol. A sufficient amount of fruits and vegetables should be consumed daily with an emphasis on **variety**. Grain products should be whole or enriched and milk products should be fat-free or low-fat. When selecting and preparing meat, make choices that are lean, low-fat, or fat-free. Intake of fats and oils high in saturated and/or trans fatty acids should be limited, while choosing products low in fats and oils. Body weight should be maintained in a healthy range by balancing caloric intake with energy expenditure. Regular physical activity is encouraged. If alcohol is consumed, it should be done sensibly and in moderation.

Source:

<http://www.health.gov/dietaryguidelines/dga2005/document/html/executivesummary.htm>

Australia

The Australian guide to healthy eating recommends that Australians enjoy a wide **variety** of nutritious foods. Plenty of whole-grain breads and cereals, vegetables including legumes, and fruits should be consumed as well as a diet low in fat, particularly saturated fat. A healthy body weight should be maintained by balancing physical activity with food intake. Alcohol intake, sugars and foods containing added sugars, and salty foods should be limited. Breastfeeding is supported and encouraged.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_au_en.stm

Canada

Canada's food guide to healthy eating suggests that people four years and over enjoy a **variety** of foods from each food group every day. The four food groups recognized include grain products, vegetables and fruit, milk products, and meat and alternatives. Lower-fat foods and leaner meats such as poultry and fish should be consumed most often. Taste and enjoyment can also come from other foods and beverages that are not part of the four food groups. Some of these foods are higher in fat or Calories, so these foods should be consumed in moderation.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_can_en.stm

China

Food based dietary guidelines in China recommend eating a **variety** of foods. Nutrient dense foods such as vegetables, and fruits and tubers should be consumed more often with grains being the staple food. Milk products and legumes should be consumed daily while lean meats like fish, poultry, and eggs should be increased in the diet appropriately. A balance between the amount of food consumed and physical activity should be maintained for a healthy body weight. The consumption of fat meat/animal fat and fat/oil should be decreased and if alcohol is consumed, it should be in moderation.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_chn_en.stm

Finland

The goal of the Food Based Dietary Guidelines is to improve the diet of the Finnish people. Dietary recommendations aim at increasing consumption of vegetables, fruit, berries, potatoes, whole-grain products with high fiber content, low-fat milk products, fish, and lean meat. They also aim at limiting the consumption of salt and salty foods as well as sugar and sugar-rich foods. Intake of hard fat should be decreased while the proportion of soft fat should be increased. Energy intake and energy expenditure should be in balance to maintain a healthy body weight. A moderate alcohol consumption and a minimum of 30 minutes of daily physical activity are also included in the recommendations.

Source: www.ktl.fi/nutrition/finnutrec98.pdf

Japan

Japanese dietary guidelines suggest enjoying delicious and healthy meals that are good for your mind and body. Aim to achieve a longer healthy life through your daily food choices. Other recommendations include establishing a healthy rhythm by keeping regular hours for meals and eating well-balanced meals with staple foods and a combination of **various foods**. Grains should be eaten at every meal to maintain sufficient intake of energy from carbohydrate while combining vegetables, fruits, milk products, beans and fish in your diet. Too much salt and fat should be avoided and when fatty foods are consumed, make a balanced choice of fat from animal, plant and fish sources. A healthy body weight should be maintained by balancing caloric intake with energy expenditure.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_jpn_en.stm

Nigeria

The general recommendations of the food based dietary guidelines aim at ensuring that the different age groups in all segments of the Nigerian population consume adequate amounts of food that contain the nutrients needed to attain and maintain good health. Good nutrition is emphasized by the consumption of as wide a **variety** of foods as possible from the age of 6 months. Fat intake from animal foods, salt and sugar should all be limited. A liberal consumption of fresh fruits in season is encouraged. A healthy lifestyle with plenty of exercise should be followed. Tobacco use in any form should be avoided and alcohol use should be moderated.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_nga_en.stm

South Africa

South African food based dietary guidelines for adults and children over the age of seven years recommends enjoying a **variety** of foods while maintaining physical activity. Starchy foods should be the basis of most meals. Dry beans, split peas, lentils, and soy should be consumed on a regular basis and chicken, fish, milk, meat or eggs can be eaten daily. Lots of clean, safe water and plenty of fruits and vegetables daily are important parts of a healthy diet. Fats, salts, and food and drinks containing sugar should be used sparingly. Alcohol should be drunk sensibly if drunk at all.

Source: http://www.fao.org/ag/agn/nutrition/education_guidelines_zaf_en.stm

D. RELEVANT LESSON PAGES

Getting Started: Lesson 1

Did you know...
healthful foods can have a positive impact on your health in the future?

There are 4 lessons in Project WebHealth that allow you to explore what it means to eat healthfully.

Remember that eating healthfully will not happen overnight. Food choices are made one meal or snack at a time. Eventually healthful eating can become a way of life for you!



[<< Previous Page](#)

[Next Page >>](#)

Getting Started: Lesson 1

Do you know...
the difference between physical activity
and exercise?

There are 2 lessons in Project WebHealth about ways to add more physical activity to your day.



Physical activity is any bodily movement that expends energy and incorporates “everyday” activities as well as things like exercise.



Exercise is planned, structured, purposeful physical activity done to improve or maintain fitness.

[<< Previous Page](#)

[Next Page >>](#)

Getting Started: Lesson 1

Set some goals for eating and being physically active.

Each week during Project WebHealth you will be asked to set goals for

- number of days and minutes you will be physically active
- number of cups of fruits and vegetables you will eat each day



Consider the benefits...

Fruits and Vegetables

- Add color, texture, and appeal to every meal
- Improve skin, hair, vision, & nails
- Provide essential vitamins, dietary fiber to keep your bowels regular, antioxidants which helps your immune system, phytochemicals that may reduce your risk of some chronic diseases
- Make you feel full and satisfied

Physical Activity/Exercise

- Strengthens your heart, bones, and muscles
- Helps manage your stress
- Reduces risk of cancer
- Allows you to sleep better

The measure of fruits and vegetable consumption is representative measure for healthy eating because most Americans do not meet the requirements of fruits and vegetables.

“A diet high in fruits and vegetables is associated with decreased risk for chronic diseases. In addition, because fruits and vegetables have low energy density (i.e., few calories relative to volume), eating them as part of a reduced-calorie diet can be beneficial for weight management. Based on data from the 2005 Behavioral Risk Factor Surveillance System (BRFSS), 32.6% of adults consumed fruit two or more times per day and 27.2% ate vegetables three or more times per day. The results underscore the need for continued interventions that encourage greater fruit and vegetable consumption among U.S. adults.”



(Centers for Disease Control and Prevention, MMWR, 2007:56(10); 213-217)

[<< Previous Page](#)

[Next Page >>](#)

Getting Started: Lesson 1

Physical Activity Goal Setting

It is recommended that everyone is at least moderately active most days of the week. Examples of moderate physical activities include, walking briskly or hiking, dancing, aerobics, or bicycling for more than 10 minutes at a time.

Currently, how many days a week are you at least moderately active?

[<< Previous Page](#)[Next Page >>](#)

Getting Started: Lesson 1

Physical Activity Goal Setting

How many days per week do you get at least 30 minutes of *exercise*?

Are you exercising at least 5 days per week for 30 minutes?

- No, and I do NOT intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes, and I have been, but for LESS than 6 months
- Yes, and I have been for MORE than 6 months

<< Previous Page

Next Page >>

Getting Started: Lesson 1

Physical Activity Goal Setting

How many days do you plan to exercise this week?

How many minutes (on average) will you spend exercising on those days?

<< Previous Page

Next Page >>

Getting Started: Lesson 1

Fruit and Vegetable Goal Setting

The 2005 US Dietary Guidelines define a cup of fruit or vegetables as 1 cup of cooked or raw vegetables, 2 cups of lettuce, 1 cup cooked or raw fruit, a piece of fruit, 1/2 cup of dried fruit like raisins, or 1 cup (8 ounces) of 100% fruit juice.

Here are other foods equal to 1 cup of a fruit or vegetable.

1 large orange	1 medium potato
2 large plums	12 baby carrots
1 large banana	20 french fries

Here is an example day:

If you eat 1 plum (1/2 cup), 1/2 cup of raisins (1 cup), 10 french fries (1/2 cup), 1 cup green beans (1 cup), 1 small orange (1 cup), and 1 cup broccoli (1 cup), that will be 5 cups.

Healthful Hint

One cup of tomato sauce is equal to 1/2 cup of vegetables.

Including snacks, how many cups of fruits and vegetables do you usually eat each day?

<< Previous Page

Next Page >>

Getting Started: Lesson 1

Fruit and Vegetable Goal Setting

The 2005 US Dietary Guidelines recommend that an 18-24 year old should eat between 3½ and 5 cups of fruits and vegetables a day.

Do you usually eat at least 3½ cups of fruits and vegetables a day?

- No, and I do NOT intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes, and I have been, but for LESS than 6 months
- Yes, and I have been for MORE than 6 months

<< Previous Page

Next Page >>

Getting Started: Lesson 1

Fruit and Vegetable Goal Setting

How many cups of fruits and vegetables a day do you intend to eat this week?

[<< Previous Page](#) [Next Page >>](#)

Getting Started: Lesson 1

Set up your own S.M.A.R.T. behavioral change objectives to achieve your goal for fruit and vegetables consumption and physical activity.



Specific to the Behavior
Measurable
Attainable
Realistic
Time bound



Here are some examples of S.M.A.R.T. behavior change objectives.

- Eat a piece of fruit for dessert instead of a sweet 2 nights this week
- Eat 2 cups of salad for lunch 3 days this week
- Attend a fitness class (aerobics, martial arts, pilates) once this week
- Do jumping jacks for at least 10 minutes while watching TV 3 nights this week

**Throughout Project WebHealth you will explore
the many ways to achieve your goals!**

[<< Previous Page](#)

[Next Page >>](#)

Maintaining a Healthy Body Weight: Lesson 10

No matter how motivated you were, think about the changes you have made during this program...

You may have started to eat more fruits and vegetables. Maybe you learned some things about "in-tune" eating or are more accepting of your body size and shape. Or you could feel, "Eh, good enough."

What do you think about your eating and exercise habits?

- I'm a couch potato living on fast foods and I am proud of it.
- I could do better with my eating and exercise habits, but...
- I'm doing a pretty good job with my eating and exercise habits.

<< Previous Page

Next Page >>

Maintaining a Healthy Body Weight: Lesson 10

Couch Potato

That's OK. You are in charge in Project WebHealth.

Although you may not be ready to change, later on, you may decide you want to start eating more healthful foods or getting more exercise. Use the resources available at your university and think about setting goals.



<< Previous Page

Next Page >>

Page 14 of 23

Maintaining a Healthy Body Weight: Lesson 10

But...

On the one hand, “I would like to eat healthier and get more exercise.” On the other hand, “I have no time, no money, and it’s hard to find healthy foods I like. It will be easier after I graduate.”



Try making a small change today:

- Find someone to play a pick-up game of basketball.
- Take the stairs.
- Add an extra vegetable with lunch.
- Pack a piece of fruit for a snack.

[<< Previous Page](#)

[Next Page >>](#)

Maintaining a Healthy Body Weight: Lesson 10

Great. Keep it up!

Having healthful habits in college will get you on the right track to being healthy for life.



Remember...
To keep improving your lifestyle

- Keep your objectives in mind.
- Know the strategies that work for you.
- Evaluate your progress and reward yourself.

[<< Previous Page](#)

[Next Page >>](#)

Maintaining a Healthy Body Weight: Lesson 10

Goal Setting

Remember... Goals should be S.M.A.R.T

Specific to the Behavior
Measurable
Attainable
Realistic
Time bound

You have been setting goals for 9 weeks. Think about the goal of exercising most days of the week.

How easy or hard is this goal for you?

How important is meeting this goal to you?

You are more likely to achieve a goal that is a challenge and important to you. If a goal is too easy, you don't accomplish anything and will get bored with it. If a goal is too hard, you are likely to fail and get discouraged. The more important it is for you to achieve a goal, the more likely you are to reach that goal. **Goals that are rated between 5 and 8 for their level of challenge and 7 or above for importance are more likely to be achieved.**

Please print this page if you would like to refer to it in the future.

<< Previous Page

Next Page >>

Maintaining a Healthy Body Weight: Lesson 10

Can you make setting fruit and vegetable and exercise goals a weekly habit?

REMEMBER...

researchers show that eating healthful foods, like **fruits and vegetables**, and getting **regular exercise** are two of the most important things you can do to stay healthy and maintain your weight.



[<< Previous Page](#)

[Next Page >>](#)

Page 17 of 23

Maintaining a Healthy Body Weight: Lesson 10



Examine and Set Your Fruit and Vegetable and Physical Activity Goals for the Week

Your profile page will keep track of your goal setting. **YOUR GRAPHS ARE NOT AVAILABLE TO THE GENERAL PUBLIC.** Your tracking graphs are for your own use only.

The 2005 US Dietary Guidelines define a cup of fruit or vegetables as 1 cup of cooked or raw vegetables, 2 cups of lettuce, 1 cup cooked or raw fruit, a piece of fruit, 1/2 cup of dried fruit like raisins, or 1 cup (8 ounces) of 100% fruit juice. Remember that combination foods such as pizza, spaghetti, and soup usually contain fruits and/or vegetables so don't forget to count them!

To the best of your ability, answer the questions below.

Last Week...

1) how many cups of fruits and vegetables **a day** did you usually eat?

2) how many **days** did you exercise?

3) how many **minutes** (on average) did you exercise on those days?

Next Semester...

1) how many cups of fruits and vegetables **a day** do you intend to eat this **spring semester**?

2) how many **days** do you plan to exercise this **spring semester**?

3) how many **minutes** (on average) will you spend exercising on those days?