ABSTRACT

A Theory-Based Investigation of Weight Change
and Nutrition Behaviors among College Students

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This research targeted the weight and nutrition behaviors of college students to help tailor marketing and educational strategies to engage more students in healthy behaviors. The purpose of this study was to examine weight change and nutrition behaviors of college students using SCT constructs, specifically environment, situation, and self-efficacy. A secondary aim of this study was to examine the differences by gender and across class years (1st year, 2nd year, 3rd year, and 4th year or greater). Data of interest was collected via a classroom based self-report assessment instrument and objective height and weight measures. Male and female college students were recruited for participation in this study. The results indicate the utility of the SCT in examining the weight change and nutrition behaviors among college students. The results also suggest that there are some differences in the weight change and nutrition behaviors of college students across class years and gender.

A Theory-Based Investigation of Weight Change
and Nutrition Behaviors among College Students

by

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A Thesis

Approved by the Department of Health, Human Performance, and Recreation

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Submitted to the Graduate Faculty of
Baylor University in Partial Fulfillment of the
Requirements for the Degree
of
Master of Public Health

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ABBREVIATIONS

ACHA-NCHA: American College Health Association-National College Health Assessment

ANOVA: Analysis of Variance

BMI: Body Mass Index

BRFSS: Behavioral Risk Factor Surveillance System

CDC: Centers for Disease Control and Prevention

CHA: Comprehensive Health Assessment Inventory

CINAHL: Cumulative Index to Nursing and Allied Health Literature

DXA: Dual Energy X-ray Absorptiometry

ECFQ: Eating Choices Food Questionnaire

ERIC: Education Resources Information Center

FFQ: Food Frequency Questionnaire

HBM: Health Belief Model

HED: Health Education

HHPR: Health, Human Performance, and Recreation

IRB: Institutional Review Board

MB-HSBI: Motivators of and Barriers to Health-Smart Behaviors Inventory

NCAA: National Collegiate Athletic Association

NCHS: National Center for Health Statistics

NHANES: National Health and Nutrition Examination Survey

SCADFR: The stages of change algorithm for dietary fat reduction

SCT: Social Cognitive Theory

SPSS: Statistical Package for the Social Sciences

TPB: Theory of Planned Behavior

TRA: Theory of Reasoned Action

TTM: Transtheoretical Model

USDA: U.S. Department of Agriculture

YRFSS: Youth Risk Behavioral Surveillance Study

GLOSSARY

3-day dietary intake: Subjects record food intake over two weekdays and one weekend day (Ha & Caine-Bish, 2009).

American College Health Association-National College Health Assessment (ACHA-NCHA): ACHA-NCHA is a nationally recognized research survey created by the American College Health Association (ACHA) to collect precise data about students' health habits, behaviors, and perceptions (ACHA, 2009).

Barriers: Belief about the tangible and psychological costs of the advised action (Champion & Skinner, 1996).

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS is a multiple-item survey established by the Center for Disease Control and Prevention (CDC) to collect information on health risk behaviors, preventive health practices, and health care access (CDC, 2009).

Body Mass Index (BMI): A number calculated from a person's weight and height that provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (CDC, 2011a).

Centers for Disease Control and Prevention (CDC): One of the major operating promotion, prevention, and preparedness agency and a global leader in public health (CDC, 2011).

Cumulative Index to Nursing and Allied Health Literature (CINAHL): CINAHL is the most comprehensive resource for nursing and allied health literature (EBSCO Publishing, 2011).

EBSCO Host: EBSCO*host* databases and discovery technologies are the most-used, premium online information resources for tens of thousands of institutions worldwide, representing millions of end-users (EBSCO Publishing, 2011a).

Education Resources Information Center (ERIC): An online digital library of education research and information that is sponsored by the Institute of Education Sciences of the U. S. Department of Education (Education Resources Information Center, 2011).

Google Scholar: Google Scholar provides a simple way to broadly search for scholarly literature (Google Scholar, 2011).

Health Belief Model (HBM): The Health Belief Model (HBM) was designed by Irwin Rosenstock, Godfrey Hochbaum, and Stephen Kegels in the 1950's as an intrapersonal

theory to explain why people were not participating in programs to prevent and detect diseases (Champion & Skinner, 1996).

MEDLINE: MEDLINE is the U.S. National Library of Medicine's (NLM) premier bibliographic database that contains over 18 million references to journal articles in life sciences with a concentration on biomedicine (U.S. National Library of Medicine [NLM], 2011).

Motivators of and Barriers to Health-Smart Behaviors Inventory: The MB-HSBI is a questionnaire designed by Tucker et al. (2011), to measure eight items: Healthy Breakfast–Motivators, Healthy Breakfast–Barriers, Healthy Foods and Snacks–Motivators, Healthy Foods and Snacks–Barriers, Healthy Drinks–Motivators, Healthy Drinks– Barriers, Physical Activity–Motivators, and Physical Activity– Barriers.

National Health and Nutrition Examination Survey (NHANES): The NHANES is a multiple-item survey designed to assess the health and nutrition status of adults and children in the United States that was created and has become a major program in the National Center for Health Statistics (NCHS) of the CDC to focus on health and nutrition measurements in order to determine how to meet the needs of people in the United States (CDC, 2009).

Obesity: Obesity is defined as a body mass index (BMI) of greater than 30 and an excessive of body fat (adipose tissue) in relation to lean body mass (Menifield, Doty, & Fletcher, 2008).

Outcome expectancies: The beliefs about the likelihood and value of the consequences of behavioral choices; things expected to happen (McAlister et al., 1996, p. 171).

Outcome expectations: Beliefs about the value you place on the things to happen (McAlister, Perry, & Parcel, 1996, p. 171).

Overweight: Overweight is defined as a BMI between 25 and 29.9 and an increase in body weight in relation to height (Menifield et al., 2008).

Physical activity: Physical activity is anything that gets your body moving (CDC, 2011c).

PsycINFO: PsycINFO is an expansive abstracting and indexing database with more than 3 million records devoted to peer-reviewed literature in the behavioral sciences and mental health, making it an ideal discovery and linking tool for scholarly research in a host of disciplines (American Psychological Association [APA], 2011).

Self-efficacy: Beliefs about personal ability to perform the behavior (McAlister et al., 1996, p. 171).

Self-regulation: Controlling oneself through self-monitoring, goal-setting, feedback, self reward, self-instruction, and enlistment of social support; self-control of performance (McAlister et al., 1996, p. 171).

Social Cognitive Theory (SCT): The Social Cognitive Theory (SCT) was developed by Albert Bandura in 1977 as an interpersonal theory designed to address an individual's learning of a behavior to determine why/how an individual does or does not participate in a given behavior (McAlister et al., 1996, p. 171).

Social norms: Standards against which appropriateness of a certain behavior is assessed (McAlister et al., 1996, p. 171).

Theory of Planned Behavior (TPB): The Theory of Planned Behavior (TPB) was developed by Fishbein and Ajzen in 1975 as a continuation of the TRA with the addition of the construct of Perceived Behavioral Control (PBC) (Montano & Kasprzyk, 1996).

Theory of Reasoned Action (TRA): The Theory of Reasoned Action (TRA) was designed by Martin Fishbein and Icek Ajzen in 1967 as an intrapersonal theory to better understand the relationships between human attitudes, intentions, and behaviors (Montano & Kasprzyk, 1996).

Transtheoretical Model (TTM): The Transtheoretical Model (TTM) was designed by James Prochaska and Carlo DiClemente in 1982 as an intrapersonal theory to integrate the process of stages of change for individual behavioral change (Prochaska, Redding, & Ever, 1996).

ACKNOWLEDGMENTS

I am grateful to my supervisor and Thesis Chair, Dr. M. Renee Umstattd Meyer, whose encouragement, guidance and support for my thesis project enabled me to develop a better understanding of the subject and contributed to my academic and professional growth.

I am thankful to my Thesis Committee members, Dr. Beth A. Lanning and Dr. A. Alexander Beaujean, for their expert opinions and guidance for my thesis project.

I am also thankful to the Health, Human Performance and Recreation Department Chair, Dr. Rafer Lutz, for his approval and support of my thesis project.

Lastly, I offer my thanks and blessings to all of those who supported me in any respect during the completion of my thesis project.

CHAPTER ONE

Introduction

Purpose and Significance

Weight change and nutrition behaviors among college students have become major health concerns for universities around the nation. According to the 1995 National Collegiate Health Risk Survey, one in five college students was overweight and there was a reported threefold increase in young adults ages 18-29 classified in the obesity class III – BMI ≥ 40 (Brooks et al., 2007). This increase in weight during the college years, especially freshman year, has been related to the dramatic changes a college student goes through during the transition from high school to college. This transition includes a change in environment, restrictions (or lack there of), social norms and exposures (alcohol, tobacco, drugs, sexual activity, etc.), and behaviors (Holm-Denoma, et al., 2008). The increasing prevalence of obesity among college students is a rising public health concern in America because of the health effects associated with adult overweight and obesity. Excess body fat associated with being overweight or obese has serious health consequences including diabetes, heart disease, hypertension, stroke, and certain cancers (Screening for Obesity, 2010).

According to Healthy People 2020, in order to maintain health and weight an individual must adopt healthy nutrition behaviors. These nutrition behaviors include 1) the consumption of a variety of nutrient-dense food to include whole grains, fruits, vegetables, low-fat or fat-free milk or milk products, and lean meats and other protein sources, 2) limiting the intake of saturated and trans fats, cholesterol, added sugars,

sodium, and alcohol, and 3) limiting caloric intake to meet only the daily caloric needs (United States Department of Health and Human Services, 2011). It is crucial for college students to abide by these recommendations to avoid weight gain and the chronic health conditions associated with obesity. The Behavioral Risk Factor Surveillance System (BRFSS) reported that the greatest increase in obesity rates was among individuals ages 18-29 with at least some college education (Wengreen & Moncur, 2009). This increase in weight change is a result of multiple contributors which include 1) food composition and eating behaviors, 2) increases in eating at restaurants, 3) increases in portion sizes, 4) increases in unhealthy snacking, 5) increases in consumption of saturated fat, 6) increases in television viewing, 7) decreases in physical activity, and 8) a lack of appropriate duration and quality of sleep (Moreno et al., 2008; Dolinsky et al., 2011). College students' alcohol consumption has also been reported to increase the chances for weight gain and unhealthy nutrition behaviors (Von ah et al., 2004). This data suggests that there is a need to study the individual and social environment factors that contribute to weight change and nutrition behaviors of college students. In studying these factors researchers may be able to address the health issues associated with weight gain and develop interventions to promote the adoption of health behaviors and healthy lifestyles by college students (Screening for Obesity, 2010).

This study was conducted to gain a better understanding of factors related with nutrition behaviors and weight change of college students. Research incorporating theories and models has been beneficial in developing stages of planning, implementing, and evaluating interventions. Theories and models are beneficial for understanding behavior and how to achieve successful behavior change in individuals (Glanz, Lewis, &

Rimer, 1996). The Social Cognitive Theory (SCT) is one such theory that has been utilized in research examining the behaviors of individuals. The SCT was included in this study because the application of the SCT constructs have been effective in establishing behavior change for college students which includes weight change and nutrition behaviors of college students. Theoretical factors have been reported as influential in examining health behaviors and behavior change among young adults (Strong et al., 2008). The SCT is as an interpersonal theory designed to address an individual's learning of a behavior to determine why/how an individual does or does not participate in a given behavior (McAlister et al., 1996). The SCT posits that an individual's behavior is a product of his/her environment, observation, and social interactions. A number of SCT constructs are consistently related with weight-loss and management behaviors, including self-efficacy, outcome-expectancy value, self-regulation, and one's perception of his/her social and physical environment where self-efficacy is viewed as one of the most influential SCT constructs (McAlister et al., 1996).

The SCT has been used to examine some aspects of weight gain and nutrition behaviors of college students, yet it has not been used to measure multiple individual and social environmental contributors. Previous studies have also examined and reported that there were class and gender differences in weight change and nutrition behaviors (LaCaille et al., 2011; Holm-Denoma et al., 2008; Racette et al., 2008; Adams & Colner, 2008; Strong et al., 2008; Furia et al., 2009; Chung et al., 2006; Brunt & Rhee, 2008; Blanchard et al. 2009; Nelson, 2007). Therefore, this study used the SCT to examine factors that theoretically should be related with weight change during college and nutrition behaviors of college students, and to subsequently examine potential gender

differences and differences between students in different class years. Further identification of gender differences in weight change and nutrition behaviors will help to better promote healthy behaviors among the students and potentially lead to more effective gender and/or age specific interventions. This study targeted the weight change and nutrition behaviors of college students to provide new information for the current literature and to provide awareness of the current health status of college students in America.

Findings from this research have several implications for researchers, health educators, and other campus health professionals with an interest in the weight change and nutrition behaviors of college students. This research provides a better understanding of the factors associated with weight change and nutrition behaviors of college students. Thoroughly examining the weight change and nutrition behaviors of college students can facilitate the implementation of universities marketing healthy behaviors and creating educational strategies to engage more students in healthy behaviors. Application of the SCT to investigate weight change and nutrition behaviors of college students was used to identify specific relationships and variables contributing to the health behaviors of college students.

Research Questions

In order to examine the weight change and nutrition behaviors of college students, the following research questions were examined:

1. What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class

years (1st year, 2nd year, 3rd year, and 4th year or greater)? Are there differences in nutrition behaviors between male and female college students?

2. Does the weight college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?
3. What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Assumptions

Aside from the general assumption that participants answered the assessment instrument honestly and completely, the research questions were based upon a series of assumptions. These assumptions are as follows:

Assumptions of Question 1: It was assumed that there would be a difference in the measures for preliminary weight and nutrition behaviors across the class years. It was assumed that there would be a difference in the preliminary weight and nutrition behaviors between males and females.

Assumptions of Question 2: It was assumed that there would be a change in the weight of college students in the fall semester. It was assumed that there would be differences between the class years. It was assumed that there would be gender differences related to weight change between male and female college students.

Assumptions of Question 3: It was assumed that perceived social and physical environment factors and associated self-efficacy level would be related to the weight and

nutrition behaviors of college students. It was assumed that there would be differences between males and females and across the class years.

Limitations

There were a number of limitations for consideration in this study.

First, this study was a cross-sectional study, thus causality cannot be inferred from the results. Second, this study relied on participants to honestly self-report their nutrition and physical activity behaviors and other SCT construct measures, thus there was potential for response bias. Another limitation was the lack of generalizability and potential selection bias associated with the use of convenience sampling. Since this research used a convenience sample of college students from a general health classes at one university in the south central United States, the results may not be generalizable to other college student populations.

Delimitations

The parameters of this study consist of students at a university in the south central United States. Upon approval from the Institutional Review Board (IRB), the assessment instrument for this research was completed by students who consented to participate in the study and who were present in class the day the assessment instruments were distributed and the anthropometric measures were conducted. Participants had to complete the assessment instrument and be at least 18 years old to be eligible for inclusion in this research project.

Public Health Benefits

The increasing rates of obesity in America, especially in college students, are alarming and indicate a need for the promotion of health behaviors and healthy lifestyles for college students. The results of this study provide further insight needed with regards to weight change and nutrition behaviors of college students. The results of this research targeted the weight and nutrition behaviors of college students, which may provide information needed to develop and implement future health interventions to improve the overall health status of college students. The results of this study may also be used to help tailor marketing and educational strategies and to develop health interventions on college campuses across the nation that focus on weight and nutrition behaviors of college students. These marketing and educational strategies and interventions could increase student engagement in healthy behaviors, decrease the prevalence of overweight and obesity among college students, and lead to the lifelong adoption of healthier behaviors of college students in America.

CHAPTER TWO

Literature Review

Overweight and Obesity in America

The United States is suffering from an increase in preventable diseases and deaths, mostly attributed to unhealthy behaviors and lifestyle choices. Obesity has now been classified as the most prevalent nutrition disorder in developed countries, and obesity rates will continue to rise if prevention efforts are not implemented (Moreno et al., 2008). According to the Centers for Disease Control and Prevention (CDC) currently over two-thirds of the American population are classified as overweight or obese; 33.4% are overweight and 33.9% are obese (CDC, 2011c). Each year, over 300,000 American adults will die from obesity related causes including hypertension, diabetes, and cancer (Menifield, et al., 2008). Obesity is defined as a body mass index (BMI) of greater than 30 and an excessive of body fat (adipose tissue) in relation to lean body mass. Overweight is defined as a BMI between 25 and 29.9 and an increase in body weight in relation to height (Menifield et al., 2008). According to Balistreri and Hook (2011), the prevalence of overweight and at-risk or overweight children and adolescents has also increased 4-16% in the past twenty-five years. Childhood and adolescent obesity leads to an increased risk of type 2 diabetes mellitus, asthma, nonalcoholic fatty liver disease, cardiovascular health issues, and mental and psychological health issues that continue to occur in the college age years (Screening for Obesity, 2010). Research has shown that overweight children and adolescents are more likely to become overweight or obese adults. According to Balistreri and Hook (2011), 75% of children between the ages of 8-

15 who were overweight or at-risk for overweight were also overweight or obese as young adults. If children under the age of 8 are classified as overweight it is more likely that obesity experienced in adulthood will be more severe with multiple health consequences (Balistreri & Hook, 2011).

The increased prevalence of obesity is a rising public health concern in America because of the detrimental health effects associated with adult overweight and obesity. Excess body fat associated with being overweight or obese has serious health consequences on the body's metabolism including: higher levels of triglycerides, low density lipoprotein (LDL; bad cholesterol), and blood sugar levels, as well as lower levels of high density lipoprotein (HDL; good cholesterol) and tissue responsiveness to insulin (Obesity in America, 2006). Other health concerns of overweight and obesity include: increased rates of diabetes, heart disease, hypertension, stroke, and certain cancers, in addition to the associated burden on the national health care system (Screening for Obesity, 2010). The ten leading causes of death in the United States are: heart disease; cancer; chronic lower respiratory diseases; stroke; accidents; alzheimer's disease; diabetes; influenza and pneumonia; nephritis, nephrotic syndrome, and nephrosis; and intentional self-harm, most of which are associated with obesity (CDC, 2011b; Kochanek, Xu, Murphy, et al., 2011). Researchers have also found that inactivity, poor nutrition, and smoking are three of the leading contributors of early death (CDC, 2011b). A lack of proper nutrition and physical activity are two of the major contributors to the obesity epidemic in America (Obesity in America, 2006). Healthy nutrition behaviors include 1) consuming foods that provide adequate amounts of energy, nutrients, and fiber that maintain health, 2) consuming foods in moderation including caloric consumption,

portion control, and awareness of total nutrients within foods, 3) consuming a balanced combination of different foods, 4) consuming a variety of foods to ensure the intake of the daily essential nutrients, and 5) consuming nutrient-dense foods – foods that are good sources of vitamins, minerals and other nutrients (Donatelle, 2012). Although unhealthy nutrition behaviors and physical activity are two of the main behavioral factors that regulate body fat, only a quarter of Americans have healthy nutrition behaviors and engage in regular physical activity. The leading contributors associated with overweight and obesity include: 1) food composition and eating behaviors, 2) increase in eating at restaurants, 3) increase in portion sizes, 4) increase in unhealthy snacking, 5) increase in consumption of saturated fat, 6) increase in television viewing, 7) decrease in physical activity, and 8) lack of appropriate duration and quality of sleep (Moreno et al., 2008; Dolinsky et al., 2011).

Weight Change among College Students

Weight gain among college freshmen students is a national public health problem related to the current obesity epidemic. According to the National Collegiate Health Risk Survey conducted in 1995, one in five college students was overweight, and there was a reported threefold increase in young adults ages 18-29 classified as obesity class III [BMI ≥ 40] (Brooks et al., 2007). Health conditions associated with overweight and obesity (diabetes, heart disease, hypertension, stroke, and certain cancers) are preventable and could be avoided with proper nutrition and physical activity (Holm-Denoma, et al., 2008). The freshman year of college is now being perceived as not only a critical period for weight gain, but also a critical period to establish lifestyle behaviors and patterns that can prevent overweight and obesity (Anderson, Shapiro, & Lundgren, 2003). Research

suggests that American young adults in their early 20's gain approximately 1.5 pounds per year until their mid-twenties, where it begins to level off (Lewis et al., 2000). Reported trends in adult weight gain also show that individuals are commonly classified as obese before age 35 due to gradual weight gain in early adulthood – ages 18-29 (Strong et al., 2008). Research also suggests that there are weight differences between males and females, reporting that male students were more likely to be overweight or obese than female students (LaCaille et al., 2011; Holm-Denoma et al., 2008; Racette et al., 2008). Racette et al. (2008) reported that female students gained an average of 3.75 pounds (0.9 pounds per year) and male students gained an average of 9.26 pounds (2.3 pounds per year) from freshman to senior in college. Overall, there has been a reported increase in the prevalence of obesity among young adults and those with higher education posing the need for further studies of the health behaviors of young adults and college students.

The Behavioral Risk Factor Surveillance System (BRFSS) reported that the greatest increase in obesity rates were among individuals ages 18-29 with at least some college education. Another report from the American College Health Association (ACHA) revealed that 36.7% of college students were overweight or obese (Wengreen & Moncur, 2009). Research supports that weight gain in the college student population is considerably greater than weight gain in the adult population at large (Levitsky, Halbmaier, & Mrdjenovic, 2004). Although college freshmen may not gain the alleged "freshman fifteen," studies have shown that some do gain 3-6 pounds in their first semester of college. This rate of weight gain is 5.5 times higher than the reported weight gain for the general population (Mihalopoulos, Auinger, & Klein, 2008). This level of

weight gain and the behavioral patterns during college, especially freshman year, may contribute to college students becoming overweight or obese later in life (Jung, Bray, & Ginis, 2008). Effective public health interventions are needed to improve the health behaviors of college students to prevent them from becoming an overweight or obese adult.

Contributors to College Weight Change

Weight gain among college students has been researched and it has been determined that weight gain is common among college students but it is variable, depending on multiple factors (Racette et al., 2008). The transition from home to college may be one of the most dramatic changes a young adult has ever experienced with a change in environment, restrictions (or lack thereof), social norms and unhealthy exposures, and behaviors (Holm-Denoma, et al., 2008). An increase in calories, poor dietary choices, minimal physical activity, and stress are some of the leading contributors to weight gain among college students, especially freshman (Levitsky et al., 2004). As previously stated, the college years imply a significant change in the lifestyles of young adults; however, college years are also crucial for the establishment of dietary patterns. Studies have reported a higher incidence in college students adopting unhealthy eating behaviors such as skipping meals, frequent snacking on energy-dense food, and engaging in unhealthy weight-loss or weight-gain methods (Ha & Caine-Bish, 2009). The average college student's dietary intake consists of high levels of fat, saturated fat, cholesterol, and sodium and low levels of fiber, vitamins A, C, and E, folate, iron and calcium. Adams and Colner (2008) reported that the majority of college students in their study did not meet the daily fruit and vegetable intake recommendations; only 25% of 18-24 year

old students consumed five or more servings a day. These patterns established during college years are likely to become long-lasting habits and have the potential for negatively affecting the health status of the individual (Ha & Caine-Bish, 2009). Diets high in fat, cholesterol, and sodium have been associated with an increased incidence rate of heart disease, cancer, and stroke (Holm-Denoma, et al., 2008). Hudd et al. (2000) reported that 52.1% of college students have high levels of stress, which is related to an increase in unhealthy eating behaviors and alcohol consumption, as well as a decrease in regular physical activity.

Research has also shown that physical inactivity contributes to weight change among college students. According to the CDC Physical Activity Guidelines for Americans (2011d), adults need at least 150 minutes of moderate-intensity aerobic activity a week for at least 30 minutes a day, at least four days a week and two or more days a week of muscle-strengthening activities. Moderate-intensity aerobic activity is categorized as brisk walking, water aerobics, riding a bike on level ground, pushing a lawn mower, etc. Muscle-strengthening activities should include the work of all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms) to include lifting weights, using resistance bands, the use of body weight for resistance (push-ups and sit ups), heavy gardening, or yoga (CDC, 2011d). Physical activity behaviors decrease for most college students as they transition from high school to college. The decrease in physical activity begins in late adolescence and is prominent during the transition to postsecondary schools (Scott, Rhodes, & Downs, 2009). In comparison to high school physical activity, Scott et al. (2009) reported that one third of college students become inactive within the first three weeks of attending a university. Decreases in physical

activity have been associated with increases in sedentary behaviors such as reading, studying, computer use, and television watching (Buckworth & Nigg, 2004). Increases in sedentary behaviors have been associated with college weight gain and have subsequently led to increases in the risk of several chronic diseases and various health conditions for college students.

Another contributor to weight gain and other health issues is alcohol consumption, which has become a wide-spread problem on many college campuses nationwide, with 60% of college students reporting some level of monthly consumption of alcohol (ACHA, 2009). Recent studies of American college students have reported an increase in binge drinking to between 37.5-44%. Binge drinking is defined as five or more drinks in a row for a man and four or more drinks in a row for a woman in a two hour sitting (Von Ah et al., 2004). Alcohol consumption, especially binge drinking, has been associated with various negative health behaviors including smoking, risky sexual behaviors, multiple sexual partners, and injuries. Increased alcohol consumption has also been associated with a decrease in healthy nutrition and physical activity behaviors, which are directly related to the weight change of college students (Von ah et al., 2004). Excess alcohol consumption has been reported to have no nutrition benefits, rather alcohol in excess provides empty calories that may lead to weight gain. The high prevalence of college students engaging in binge drinking may increase the risk of short- and long-term alcohol related health problems, and nutrition deficiencies as these students age (Morton & Tighe, 2011).

Interventions

The increasing rates of obesity in America, especially among college students, are alarming and demonstrate a tremendous need for implementation of health interventions aimed at increasing the adoption of health behaviors related with obesity prevention. Interventions deemed effective by the United States Preventive Services Task Force are weight-management programs or interventions that incorporate counseling, diet and physical activity, and provide strategies to assist in long-term behavior change (Screening for Obesity, 2010). In addition to these suggestions Moreno et al. (2008) concluded that interventions should include a multidisciplinary approach of nutrition and individual diet counseling, modification of diet and caloric content, increased physical activity and exercise, activities for participants to engage in behavior changing activities and group therapy, and support and encouragement for behavior change. The goals of any intervention striving to decrease the prevalence of overweight and obesity should focus on lifestyle change and reducing the long-term risk factors and health outcomes associated with obesity.

Health interventions may provide the best impact if implemented at the college age level based upon the impressionability and potential for positive adherence of college students (Ha & Caine-Bish, 2009). Class-based interventions have shown to be an effective approach in changing health behaviors of college students. Class-based interventions also require minimal manpower and financial resources, thus proving to be a cost-effective method to impact the health behaviors of college students (Ha & Caine-Bish, 2009). It is also recommended that these interventions target the mediators of weight gain through the inclusion of goal setting, planning, and self-monitoring nutrition

and physical activity behaviors (Strong et al., 2008). The interventions should also incorporate social and environmental support to increase adherence and long-term healthy lifestyles through adulthood (Strong et al., 2008).

Significance of the Inclusion of Theory

Research incorporating theories and models has been beneficial in developing stages of planning, implementing, and evaluating interventions, as they explain behavior and how to achieve successful behavior change in individuals (Glanz, Lewis, & Rimer, 1996). Theoretical factors have also been influential in examining health behaviors and behavior change among young adults (Strong et al., 2008). The Social Cognitive Theory (SCT), Theory of Planned Behavior (TPB), the Health Belief Model (HBM), and the Transtheoretical Model (TTM) have been applied to understand or change dietary behavior and/or weight. Research incorporating theory to better understand weight change and nutrition behaviors among college students were reviewed.

Methods

Searches to gather literature on models, theories, and health behaviors of college students were conducted using CINAHL, ERIC, PsycINFO, MEDLINE, EBSCO Host, and Google Scholar databases using the keywords "overweight and obesity in America," "college," "theory," "college weight gain and theory," "college students health," "college students," "nutrition," "freshmen fifteen (15)," "dietary intake," "physical activity," "health behaviors," "social determinants," "social cognitive theory," "theory and models," "dietary behaviors," "factors-college students-health behaviors," "BMI," "weight," "weight gain," and "eating behavior." The previously listed terms were used as

criteria for the search and results that did not include theory, model, college students, nutrition, health behaviors, physical activity, and weight were excluded from the review. Further search criteria included articles that were peer reviewed, published within the years 2000-2011, in English, and references were available. All articles that included the criteria mentioned were included for the literature review and were then clustered according to the theory(ies) applied in the study(ies) and topic. The studies were summarized individually to include the study purpose, design, participants, theoretical constructs, statistics, results, and limitations. This initial search resulted in the identification of 110,250 studies. After further review using the above described inclusion criteria, 39 studies were retained for review.

Theoretically Based Investigations of Weight Change and Nutrition Behaviors

This literature review consists of 20 studies, of which, each included the effects of theories on the weight changes and nutrition behaviors of college students. Of the studies identified, three used the TPB, four used the HBM, seven used the TTM, and eight used the SCT. These studies are presented by theoretical premise below.

Theory of Planned Behavior

The Theory of Reasoned Action (TRA) was designed by Martin Fishbein and Icek Ajzen in 1967 as an intrapersonal theory to better understand the relationships between human attitudes, intentions, and behaviors. The TRA explains that the intention of an individual depends on his/her attitude about the behavior and his/her interpretation of subjective norm; do most people approve or disapprove of the behavior (Montano & Kasprzyk, 1996). The TPB was designed by Fishbein and Ajzen in 1975 as a

continuation of the TRA with the addition of the construct Perceived Behavioral Control (PBC). PBC was included to determine the factors outside an individual's control that may affect intentions and behaviors. The addition of PBC was also included to address situations where an individual may not have complete volitional control over a behavior and the idea that behavioral performance is determined by motivation (intention) and ability (behavioral control). The benefits of the TPB are that it provides an excellent framework to conceptualize, measure, and identify factors that affect behavior. The challenges of the TPB are that if the proportion of the selection of beliefs is too small it will not provide accurate determination of intentions, and if the wrong beliefs or behaviors are analyzed they may not represent true intention (Montano & Kasprzyk, 1996). There are four main constructs of the TPB which are listed and defined in Table 1.

Table 1.

Theory of Planned Behavior Constructs.

Construct	Definition
Behavioral Intentions	An individual's intention to perform the behavior.
Attitude	An individual's beliefs about the outcomes or attributes of performing the behavior based upon evaluation of the outcomes and attributes. Concepts: 1. Behavioral beliefs: the beliefs about the outcome or attributes of the behavior. 2. Evaluations of behavioral outcomes
Subjective Norm	Determined by normative beliefs, weighted by the motivation to comply with those referents.

(Continued)

Construct	Definition
Subjective Norm (Continued)	Concepts: 1. Normative beliefs: whether important referent individuals approve or disapprove of performing the behavior. 2. Motivation to comply: desire to comply with those referents.
Perceived Behavioral Control	The factors outside an individual's control that may affect intentions and behaviors; weighted by their perceived power. Concepts: 1. Control beliefs: belief of perceived behavioral control. 2. Perceived power: the impact of each control factor to facilitate or inhibit the behavior.
Additional Concept	
External variables	Demographic variables Attitudes towards targets Personality traits Other individual difference variables

Notes. Adapted from "Theory of Reasoned Action, Theory of Planned Behavior, and the Integrated Behavioral Model," by D. Montano & D. Kasprzyk, p. 70-1. Copyright 1996 by John Wiley & Sons, Inc.

The TPB has been applied to determine the intentions and behaviors of college students to engage in healthy dietary behaviors. The TPB explains an individual's intention as a central predictor if the individual will perform the behavior (Blanchard et al., 2009). An individual's intention is influenced by three main factors: attitude, subjective norm, and PBC. In searching current literature, three studies – one prospective, one cross-sectional, and one non-experimental – were identified that used the TPB as a framework to describe or modify weight change related behaviors. In these studies, all three of the main TPB constructs were consistently related with weight-loss and management behaviors (Blanchard et al., 2009), to predict the intentions to eat a healthful diet (Pawlak, Malinauskas, & Rivera, 2009), and to evaluate the impact of a health awareness course (Soweid et al. 2003). A number of the constructs were included

in college-based interventions related to food consumption, including attitude, subjective norm, and PBC.

The utilization of the TPB has been applied to determine the intentions and behaviors of college students to consume the daily-recommended amount of fruits and vegetables. Blanchard et al. (2009) conducted a prospective design study to examine if the TPB constructs could explain the fruit and vegetable consumption of college students in a one week, 5-A-Day health promotion intervention. The researchers also examined whether moderation occurred by gender or ethnicity. The study consisted of 511 participants enrolled in undergraduate fitness and health classes from two universities. The researchers conducted a preliminary TPB questionnaire and then one week later conducted a follow-up questionnaire with items from the BRFSS to measure the fruit and vegetable consumption over the past week (Blanchard et al., 2009). The validity and reliability of the study instruments were contributed to the prior use of the instruments in previous studies. Various analyses were conducted (e.g., Little's chi-square test, separate variance *t* test, and correlations) to determine the relationship between the TPB and fruit and vegetable consumption. Results revealed that the TPB constructs of attitude and intention were important in the reinforcement of consuming five servings of fruits and vegetables a day. These results also suggested that intention was a main predictor of fruit and vegetable consumption in college students and should thus be addressed in interventions aimed to improve dietary behaviors of college students (Blanchard et al., 2009). Future consumption studies should utilize a randomized sample of participants to minimize the selection bias and increase the generalizability of the results for the actual fruit and vegetable consumption of college students.

The TPB has also been examined to determine the important factors to college baseball players regarding intention to eat a healthful diet. Pawlak et al. (2009) conducted a cross-sectional study to examine if the TPB constructs could explain the behavioral intention to eat a healthful diet of college baseball players. The study consisted of athletes from one National Collegiate Athletic Association (NCAA) Division I team. Pawlak et al. (2009) conducted an open-ended questionnaire administered by a registered dietitian to gather information of behavioral, normative, and control beliefs about healthful diet. Internal consistency (Cronbach alpha; α) of the TPB instruments was reported and ranged from 0.85 to 0.95 (Cronbach, 1951). Multiple linear regression analyses were conducted to determine how attitude, subjective norms, and PBC predicted the behavioral intentions to eat a healthful diet (Pawlak et al., 2009). Results revealed that the combination of attitude, subjective norms, and PBC accounted for 70% of the variance in behavioral intention. Results also revealed that attitude had the greatest influence on intention yet the most important factor in predicting intentions to eat a healthy diet was the belief that a healthy diet would improve focus and concentration (Pawlak et al., 2009). Despite the findings the study was limited due to the use of a self-reported, convenience sample and the actual food intake of the students was not assessed.

Soweid et al. (2003) conducted a one-group pretest posttest non-experimental design study to evaluate the impact of a health awareness course on attitudes and behaviors of the students enrolled in the course. The study consisted of 16 students enrolled in an introductory "Health Awareness" course who completed pre and post assessments. Soweid et al. (2003) conducted a self-report evaluation survey – the Comprehensive Health Assessment Inventory (CHA) – to assess the attitude and behavior

of the students related to the health topics covered in the course. Referred validity of the CHA was contributed to the previous design and use of the instrument. Analyses to examine the effectiveness of the course included descriptive statistics, sum and average analyses for each health-related topic, and paired analysis of means. Results revealed that the course significantly improved the students' knowledge, attitude, and behavior related to health (Soweid et al., 2003). Although this study revealed that the course did have a positive impact on the students enrolled, it was limited due to the small sample size and potential selection bias.

Health Belief Model

The HBM was designed by Irwin Rosenstock, Godfrey Hochbaum, and Stephen Kegels in the 1950's as an intrapersonal theory to explain why people were not participating in programs to prevent and detect diseases (Champion & Skinner, 1996). The HBM predicts an individual's health behavior or change based on the following constructs: (1) perception of being susceptible to a disease, (2) perception of the severity of the disease, (3) perceived benefits of participating in a health-related behavior or change, (4) perceived barriers to being able to participle in the health-related behavior or change, (5) cues to take action, and (6) self-efficacy (Champion & Skinner, 1996). See Table 2 for a list and definitions of the six main HBM constructs.

Table 2.

Health Belief Model Constructs.

Construct	Definition
Perceived Susceptibility	An individual's belief about the chances of experiencing a risk, condition, or disease.

(Continued)

Construct	Definition
Perceived Severity	An individual's belief about how serious a condition and the consequences can be.
Perceived Benefits	An individual's belief in the benefits of the advised action to reduce the risk or seriousness of the outcomes.
Perceived Barriers	An individual's belief about the tangible and psychological costs of the advised action.
Cues to Action	The strategies used to activate "readiness."
Self-Efficacy	An individual's confidence in his/her ability to take action.

Notes. Adapted from "The Health Belief Model," by V. Champion & C. Skinner, p. 48. Copyright 1996 by John Wiley & Sons, Inc.

The HBM has been used to examine predictors of health behaviors in college students. The HBM has been widely used to explain change and maintenance of health-related behaviors for individuals and it has been used as a framework for health interventions (Champion & Skinner, 1996). In searching current literature, four studies – two cross-sectional, two correlational – were identified that used the HBM as a framework to describe or change weight or dietary behavior. In these studies, a number of HBM constructs were consistently related with weight-loss and management behaviors, including self-efficacy (Von ah et al., 2004; McKinley, 2009), perceived threats, perceived benefits (Von ah et al., 2004), perceived barriers (Von ah et al., 2004; Sands, Archer, & Puleo, 1998), and perceived susceptibility and severity (Ronis, 1992; Sands et al., 1998). A number of the HBM constructs have also been included in college-based interventions aimed to improve health behaviors such as alcohol consumption, smoking, physical activity, and nutrition behaviors.

In 2004, Von ah et al. conducted a cross-sectional study to investigate the effects of perceived stress, social support, self-efficacy, threat, benefits and barriers for alcohol and smoking, physical activity and nutrition behavior. The study consisted of 161 college students enrolled in an introductory psychology course at the University of Alabama. The researchers used a 102-item self-report questionnaire with items from the Perceived Stress Scale, Social Support Questionnaire, Health Behavior Questionnaire, BRFSS, Sun Protective Behavior Scale, and a self-efficacy measure created for this study. The HBM components were measured with a questionnaire constructed for the study that was based on previous studies. Internal consistency (α) of the HBM instruments ranged from 0.55 to 0.97 (Cronbach, 1951). Descriptive statistics, two-step hierarchical multiple regression models, and structural equation modeling were used to examine relationships of interest. Results revealed that self-efficacy was the only significant predictor for all five of the health behaviors, and that it was a positive influence for all the behaviors except smoking (Von ah et al., 2004). Results also revealed that perceived barriers had a significant and negative impact on the examined health behaviors of college students. These results support the use of the HBM to examine why college students engage or do not engage in certain health behaviors. This study was limited due to the use of a cross-sectional self-report questionnaire design and the small sample size that minimized the generalizability of the results.

Sands, Archer, and Puleo (1998) used theories of health behavior (HBM and SCT) to determine factors that predict behavior change in college students including nutrition, alcohol, and sexual behaviors. The study consisted of 356 undergraduate college students in counselor education, psychology, and Air Force classes at a

southeastern university. Sands et al. (1998) administered a questionnaire that included measures for 1) demographics, 2) behavioral assessment for nutrition, alcohol, and sexual behavior, 3) general identity/confidence, 4) self-efficacy, 5) social influence, and 6) HBM dimensions. Validity of all measures was contributed to the previous design and use of the instruments. Three multiple regression analyses were conducted to determine the relationships between the predictor variables (Sands et al., 1998). Results revealed that self-efficacy was the strongest predictor for alcohol prevention behaviors, identity/confidence was the strongest predictor for AIDS-prevention behavior, and social influence had the greatest affect on healthy eating behaviors of college students (Sands et al., 1998). The HBM constructs perceived barriers and perceived severity were reported as influential predictors for all three health promoting behaviors. This study was limited by unvaried sample population, self-reported data, and minimal large-scale use of the measures applied in the study.

The perceived threat of negative health consequences associated with eating behaviors has also been studied among college students. McKinley (2009) conducted a correlational study to examine the relationship between perceived threats of obesity, social support, and college students' eating attitudes and behaviors, which included 248 undergraduate college students enrolled in various communication courses. Students completed a questionnaire measuring demographics, self-efficacy, self-response, appearance concerns, social support, and health eating behaviors. Validity and reliability of the study instruments were established in previous studies, but were not directly mentioned or tested by McKinley. Analyses to examine the hypothesized relationships between predictors and eating behaviors included descriptive statistics, correlations, and a

series of hierarchical regressions. Results revealed that self-efficacy and perceived threat were independently and directly associated with the healthy eating behaviors of college students (McKinley, 2009). Results also revealed that perceived severity of obesity was associated with female students' eating habits (e.g., a fear of not being thin rather than a fear of health consequences). Although this study revealed that perceived threats and self-efficacy were associated with college student eating behaviors, the correlational study design did not allow for causality to be examined. To strengthen the study it would be beneficial to use a longitudinal study with a control or comparison group.

In 1992, Ronis conducted a quasi-experimental study with a single sample post-test only design to examine the effects of manipulating susceptibility and severity variables with regards to attitude toward a preventive action. The study consisted of 33 undergraduate psychology students at a major university. The experiment was a scenario-based design that examined the judgment to consume a certain food if the participants knew it could reduce the severity of and susceptibility to a certain disease. The participants were given information about an imaginary disease (*Zybo*) and food (*Prova*) that could reduce the severity of and susceptibility to Zybo. The information provided about Zybo included 1) the susceptibility to Zybo if Prova was not consumed, 1) the severity of Zybo if Prova was not consumed, 3) the susceptibility to Zybo if Prova was consumed, and 4) the severity of Zybo if Prova was consumed (Ronis, 1992). These items were independently varied so the functions relating them to participants' attitude toward eating Prova and perceived benefit could be determined. The experimental materials were presented to the participants in a questionnaire booklet that included sixteen combinations of experimental manipulations that the participants answered

according to their perception of the situation. Sum analyses of the questions from the questionnaire were conducted to determine the validity of the results – perceived benefit α=0.81 and attitude α=0.92. External validity of the study was confirmed with a comparison study conducted by Ronis and Harel (1989). Results revealed that all the correlations were significant ($p \leq 0.01$). Attitude toward eating the food was increased by the perceived benefit (r=0.716), chance (r=0.156), and severity (r=0.097) of the disease. Benefit was increased by chance (r=0.151) and severity of the disease (r=0.181). This study was limited due to the use of a self-reported, convenience sample, and small sample size.

Transtheoretical Model

The TTM was designed by James Prochaska and Carlo DiClemente in 1982 as an intrapersonal theory to explain how individuals move across stages of change in the adoption and maintenance of behavior change, through the use of processes of change. Prochaska and DiClemente originally developed the TTM to determine the stages for cessation behaviors and later additive behaviors. The TTM has four main constructs with multiple concepts that are listed in Table 3. The first construct is the stages of change, which describes how an individual moves into readiness to adopt behavior change through six stages over time. The second construct is the processes of change, which are the cognitive and behavioral strategies that help facilitate movement from one stage to the next. The third construct is decisional balance, which is an individual's ability to weigh the pros and cons of the behavior change. The last construct is self-efficacy, which is the situation-specific confidence that individual's can cope with the situation without relapsing to the former behavior (Prochaska, Redding, & Ever, 1996).

The stages of change within the TTM have been applied to determine weight change and behavioral patterns of college students. The most popularly applied construct

Table 3.

Transtheoretical Model Constructs.

Concept	Definition
Stages of Change	
Precontemplation	The individual has no intention to take action within the next six months.
Contemplation	The individual intends to take action within the next six months.
Preparation	The individual intends to take action within the next thirty days and has taken some preparatory steps in this direction.
Action	The individual has changed the behavior for less than six months.
Maintenance	The individual has changed the behavior for more than six months.
Termination	The individual experiences no temptation to relapse and is 100% confident.
Process of Change	
Consciousness Raising	The individual finds and learns new facts, ideas, and tips that support the healthy behavior change.
Dramatic Relief	The individual experiences the negative emotions (fear, anxiety, worry) that go along with unhealthy behavioral risks.
Self-Reevaluation	The individual realizes that the behavior change is an important part of his/her identity as a person.
Environmental Reevaluation	The individual realizes the negative impact of the unhealthy behavior or the positive impact of the healthy behavior on his/her social and/or physical environment.
Self-Liberation	The individual makes a commitment to change.
Helping Relationships	The individual seeks social support for the healthy behavior change.
Counterconditioning	The individual substitutes healthier alternative behaviors and cognitions for the unhealthy behavior.

(Continued)

Concept	Definition
Reinforcement Management	The individual receives an increase in the rewards for the positive behavior change and a decrease in the rewards of the unhealthy behavior.
Stimulus Control	The individual removes reminders or cues to engage in the unhealthy behavior and adds cues or reminders to engage in the healthy behavior.
Social Liberation	The individual realizes that the social norms are changing in the direction of support for the healthy behavior change.
Decisional Balance	
Pros	Benefits of changing the behavior.
Cons	Costs of changing the behavior.
Self-Efficacy	
Confidence	The individual's confidence that he/she can engage in the healthy behavior during challenging situations.
Temptation	The temptations experienced by the individual to engage in the unhealthy behavior during challenging situations.
Stimulus Control	The individual removes reminders or cues to engage in the unhealthy behavior and adds cues or reminders to engage in the healthy behavior.

Notes. Adapted from "The Transtheoretical Model and Stages of Change," by J.O. Prochaska, C.A. Redding, & K.E. Ever, p. 98-9. Copyright 1996 by John Wiley & Sons, Inc.

of the TTM is the stages of change, which is regularly used to explain the progress an individual makes in attempting behavior change (Prochaska et al., 1996). In searching current literature, seven studies – three cross-sectional, two correlational, one intervention, and one non-experimental – were identified that used the TTM as a framework to describe or change weight or dietary behavior. In these studies, mainly the stages of change were consistently related with weight-loss and management behaviors

(Racette et al., 2005). The stages of change TTM construct was included in college-based interventions related to dietary patterns and weight gain (Racette et al., 2005; de Oliveira et al., 2005; Chung et al., 2006; Hu et al., 2011; Finckenor & Byrd-Bredbenner, 2000), health promotion (Horneffer-Ginter, 2008), and to determine the impact of a health awareness course (Soweid et al., 2003).

Racette et al. (2005) examined weight, exercise, and dietary patterns to determine associated changes for students during the freshman and sophomore years of college. The study consisted of a questionnaire administered at the beginning of freshman year (n=764), and a follow-up assessment that occurred at the end of sophomore year (n=290). Questionnaires included demographic information and BMI measurements, a stages-of-change questionnaire, and a dietary questionnaire. Validity and reliability of the study instruments were established in previous studies designed to assess the readiness to make change (Racette et al., 2005). Descriptive statistics were used to analyze overall characteristics and *t*-tests were used to analyze changes in outcome over time. Results revealed that body weight increased in 70% of the students, there was a reduction in the percentage of students in the maintenance phase for exercise, and there was no significant change for readiness to engage in healthy eating behaviors (Racette et al., 2005). The results also revealed that the college environment potentially promotes negative change in physical activity and eating behaviors of students. This study was limited due to self-selection bias, as students may have decided to return for the follow-up assessment based upon their confidence in their current health status.

De Oliveira et al. (2005) conducted a cross-sectional study to develop a tool to measure processes of change for fruit and vegetable consumption and to examine the

relationship between stage and processes of change among cultural groups. The study consisted of 45 male college students who completed surveys that assessed stage, process of change, fruit and vegetable food intake, and demographic data. The survey included 1) validated questions from the 5 A Day studies to measure the stages of change, 2) the creation of 137 items for the fruit and vegetable processes by a nutritionist and psychologist to assess the 10 processes, 3) a 7-item food frequency questionnaire to measure the fruit and vegetable intake over the past month, and 4) demographic items (de Oliveira et al., 2005). Various analyses were used to determine differences in the processes of change and relationships between stage of change and fruit and vegetable consumption including analysis of covariance, two-way analysis of variance, and paired *t* tests. Results revealed that the instrument was reliable because all 10 process scales had high internal consistency measures. However, the study did not provide significant explanations for the cultural differences related to stage and processes of change. This study was limited due to the use of self-reported measurements, convenience sampling, and a small sample size that is potentially not generalizable.

Chung et al. (2006) conducted a cross-sectional study to examine the relationship between stages of change and the use of processes of change for eating the recommended five servings of fruits and vegetables a day among 236 college women from two introductory nutrition classes at a north central university. The study included three sets of instruments that the students completed outside of class which included 1) a staging algorithm to measure the stages of readiness to eat enough fruits or vegetables, 2) 3 day dietary records of all food and beverages consumed, and 3) a previously developed instrument to assess the processes of change used by students to eat enough fruits and

vegetables (Chung et al., 2006). Twelve content experts determined content validity. The stages for fruit and vegetable intake were measured separately using the staging algorithm and investigators categorized the responses according to the participants deemed stage of change. Various analyses were used to determine the use of identified processes of change that college students used to eat enough fruits and vegetables, including standardized *t*-scores, analysis of variance, and Tukey's multiple comparison tests. Results revealed that there were significant stage effects with the constructs for processes of change. There was a significant difference in the fruit and vegetable intake between participants in the precontemplation or contemplation stage and the preparation stage. For both fruit and vegetable intake, the use of self-reevaluation and health commitment/action differed significantly among stages (Chung et al., 2006). Despite the findings the study was limited due to the use of a self-reported, convenience sample, and a small sample size that is not generalizable.

Stages of change have also been used to determine patterns and correlates of diet and exercise among college students. Hu et al. (2011) conducted a correlational study with 693 Hispanic undergraduate students at a university on the U.S.-Mexican border. The researchers used a questionnaire that included demographic, psychosocial, and acculturation measures and assessed the stage of change the students were in for three health behaviors: exercise, dietary fat intake, and fruit and vegetable intake (Hu et al., 2011). Validity and reliability of the study instruments were contributed to the prior use of the TTM instruments in previous studies assessing the readiness to make change (Hu et al., 2011). Stage distributions were reported for each behavior by dichotomizing the behaviors from a 5-stage algorithm and then categorizing the individuals based on the

reported stage for each behavior. Results revealed that nearly 32% of the participants were overweight or obese. Participants who reported action or maintenance stages were categorized as "not at risk" but participants who reported precontemplation, contemplation, or preparation stages were categorized as being "at risk" because they failed to perform or to meet recommendations for the desired behavior. Exercise was the only behavior that most participants were categorized as "not at risk," yet participants were "at risk" for adherence to dietary fat and fruit and vegetable recommendations (Hu et al., 2011). This study was limited due to the potential bias of self-reported data, the lack of detailed information regarding the participants' diet and exercise (self-report, limited measures), and the sample may not be generalizable to the entire college population.

Horneffer-Ginter (2008) conducted a corrleational study to examine how the assessment of stage distribution and the identification of a behavior can assist in planning college health promotion interventions. The study consisted of 304 students from three sections of an undergraduate general education health course. The researchers utilized a self-report questionnaire which included 1) the Health Risk Assessment Form to measure the students' stages of change for exercise, eating healthy, smoking, consuming alcohol, managing stress, and managing depression and 2) the Possible Selves instrument to measure an individual's self-concept in relation to the readiness to change. Validity of both measures was previously established and referenced by the authors. The stages of change were analyzed using algorithms developed by Prochaska and colleagues and the possible selves were analyzed with paired *t* tests and one-way analysis of variance (Horneffer-Ginter, 2008). Results revealed that the highest percentage of students were

in the precontemplation stage for alcohol consumption (~38%) and diet (~46%), 50% were in the maintenance stage for stress, 70% reported never smoking cigarettes, and a range of 12-46% were in the preparation mode for all of the behaviors (Horneffer-Ginter, 2008). For the general possible selves, there was no significant difference between the first hoped-for self and the feared possible self, however, for health and well-being, the first feared self was rated as more important than the first hoped-for self (Horneffer-Ginter, 2008). Although the findings suggest that the TTM may be a useful tool in promoting health among college students future studies should focus on causal relationships within the data through the use of a longitudinal, comparative study.

Finckenor and Byrd-Bredbenner (2000) conducted a study to develop and evaluate an intervention based on the stages of change to help participants' lower dietary fat intake. The study consisted of 110 undergraduate students from five different sections of an introductory nutrition science course – 38 in the experimental group, 30 in the pre/post control group, and 42 in the post-only control group. The experimental group completed the pre- and post-test and participated in the eleven-lesson intervention, the pre/post control group completed the pre- and post-tests, and the post-only group completed only the post-test (Finckenor & Byrd-Bredbenner, 2000). The study consisted of eleven 15-minute intervention lessons focusing on dietary fat reduction and three self-report instruments which included demographic items, the Eating Choices Food Questionnaire (ECFQ), and the stages of change algorithm for dietary fat reduction (SCADFR). Kristal et al. (1990) were referenced in having developed and validated the ECFQ and SCADFR used in this study. The items were analyzed with analysis of variance, Scheffe *F* test, and paired *t* test. Based on the pretest scores the participants

were placed in one of two subgroups: the preaction stage group or the action/maintenance stage group. Results revealed that all groups participating in the pre-test lowered their mean fat intake between the pre- and post-test and the participants in the experimental and pre/post control groups increased their mean stage of change. There were no significant differences in mean ECFQ or mean SCADFR pretest scores between the corresponding experimental and pre/post control subgroups (Finckenor & Byrd-Bredbenner, 2000). This study was limited by a small sample size and potential lack of generalizability to other college students.

Although the study conducted by Soweid et al. (2003) was previously mentioned with the studies utilizing the TPB, the researchers also measured constructs of the TTM within the study (n=16). Please refer to the TPB section for details regarding the study and analyses. Results of this portion of the study revealed that students originally in the contemplation stage for fruit and vegetable consumption moved forward at least one stage, seven students moved forward at least one stage for exercise, and two students moved forward at least one stage to cease smoking. Although this study revealed that the course did have a positive impact on the students enrolled the study, it was limited due to the small sample size and potential selection bias.

Social Cognitive Theory

The SCT was developed by Albert Bandura in 1977 as an interpersonal theory designed to address an individual's learning of a behavior to determine why/how an individual does or does not participate in a given behavior. The SCT was originally called the social learning theory because Bandura based it on the principle of learning within the human social context (McAlister et al., 1996). Bandura determined that an

individual's behavior reflects upon his/her environment, observation, and social interactions. The SCT is used to understand human information processing capacities and biases that influence learning from experience, observation, and symbolic communication. The SCT posits that human behavior is based on reciprocal determinism of the continuous interaction of behavior, personal factors, and environment. Bandura postulated that the construct of self-efficacy, defined as the confidence an individual has to perform a behavior that brings desired outcomes, is a key component in an individual's ability to initiate and maintain behavior change (McAlister, et al., 1996). Several benefits of the SCT are 1) it incorporates and measures multiple constructs that affect an individual's behavior, 2) it consists of action-oriented research and practice, and 3) it incorporates self-efficacy, reciprocal determinism, and environment as being some of the main components and factors providing successful behavior change. Challenges of the SCT include that the information relies mostly on individual perceptions and responses, thus more time has to be spent catering to the specifics for each individual involved in a study. The SCT has also been considered too broad and ambiguous, and rarely are all of the constructs used in a particular intervention (McAlister et al., 1996). The main constructs of the SCT are listed in Table 4.

The SCT has been successfully used to determine weight change and behavioral changes in college students. The SCT explains human behavior as observational, dynamic, and a reciprocal interaction of personal factors, behaviors, and the environment (Anderson et al., 2007). In searching current literature, seven studies – four cross-sectional, one investigative, one intervention, and one qualitative – were identified that used the SCT as a framework to describe or change weight or dietary

behavior. In these studies, a number of SCT constructs were consistently related with weight-loss and management behaviors, including self-efficacy (Ha & Caine-Bish, 2009; Strong et al.,

Table 4.

Social Cognitive Theory Constructs.

Construct	Definition
Reciprocal determinism*	Behavior (learning), personal (factors), and environment all influence one another (i.e. environments and situations). -Social support: How an individual perceives information, comfort, and help provided by others.
Reciprocal determinism (continued)*	-Social norm: the standards placed to determine to appropriateness of a certain behavior.
Behavioral capability**	The knowledge and skills to perform a behavior used to demonstrate skills training.
Environment**	The factors physically external to the individual.
Situation**	An individual's perception of the environment.
Outcome expectations*	The beliefs about the likelihood and value of the things expected to happen based upon behavioral choices (i.e. consequences).
Outcome expectancies*	The beliefs about the value placed on the things to happen.
Self-efficacy*	An individual's confidence and belief about his/her ability to perform the behavior.
Collective efficacy*	The beliefs about the ability of a group to perform actions and behaviors that results in the desired outcomes.
Observational learning*	The process of learning to perform a new behavior through observing interpersonal or media displays of the behavior - peer modeling (i.e. vicarious learning).

(Continued)

Construct	Definition
Incentive motivation*	The use and misuse of rewards and punishments to modify behavior (i.e. reinforcement). Intrinsic (positive) and extrinsic (negative) rewards.
Facilitation*	Provision of the tools, resources, or environmental changes that make new behaviors easier to perform.
Self regulation*	The ability to control one's behavior through self-monitoring, goal-setting, feedback, self reward, self-instruction, and social support (i.e. self-control of performance).
Moral disengagement*	The thinking of an individual to engage in a behavior that may be harmful to others by disengaging one's self-regulatory moral standards (i.e. controlling one's emotional arousal).

Note. *Adapted from "How Individuals, Environments, and Health Behaviors Interact," by A. McAlister, C. Perry, & G. Parcel, *Health behavior and health education: theory, research, and practice*, p. 171. Copyright 1996 by John Wiley & Sons, Inc, **Adapted from "Effect of Nutrition Intervention Using a General Nutrition Course for Promoting Fruit and Vegetable Consumption among College Students," by E.-J. Ha & N. Caine-Bish, 2009, *Journal of Nutrition Education & Behavior*, *41*, p. 105. Copyright 2009 by the Society for Nutrition Education.

2008; Clifford et al., 2009), outcome-expectancy value (Ha & Caine-Bish, 2009; Strong et al., 2008), self-regulation (Ha & Caine-Bish, 2009; Strong et al., 2008), and one's perception of his/her social and physical environment (Ha & Caine-Bish, 2009; Brunt & Rhee, 2008; Moczulski et al., 2007; Sands et al., 1998; Strong et al., 2008; LaCaille et al., 2011). A number of the SCT constructs were included in college-based interventions related with food consumption, environmental behaviors, and weight gain.

Ha and Caine-Bish (2009) conducted a pre/post-test intervention study to assess the current intake of fruits and vegetables of college students and to evaluate the effectiveness of a 15-week intervention [nutrition education class] on the changes in fruit and vegetable consumption of college students. Class topics and activities incorporated

the following SCT constructs: behavioral capacity, environment, situation, expectancies, self-control, expectations, reinforcements, and reciprocal determination. The study included 80 healthy college students at a mid-western university between the ages of 19-35 who were enrolled in a sophomore-level nutrition class. The researchers conducted a pre- and post-test 50-minute interview with each participant to get height and weight measures and verify that 3-day food records were completed and accurate. To ensure accurate food records a variety of tools and procedures were used, including 1) food measuring utensils, 2) the collection of food labels for the participant food intake, 3) local restaurant ingredient and nutrient lists, and 4) food items purchased by researchers to determine portion sizes (Ha & Caine-Bish, 2009). Means and standard deviations were calculated for the variables using SPSS. Differences in fruit and vegetable variables were analyzed with pooled and paired *t*-tests. Results revealed a statistically significant increase in the consumption of fruits and vegetables between the pre- and post-test as well as a significant decrease in french fry consumption (Ha & Caine-Bish, 2009). By the conclusion of the class 65% of participants were consuming more than one cup of vegetables per day, 50% were consuming more than one cup of fruits per day, and 22% were consuming more than two cups of fruit per day. These results suggest that the inclusion of SCT constructs in a nutrition intervention for college students may help increase the consumption of fruits and vegetables to help this age group meet U.S. Department of Agriculture (USDA) daily recommendations; however, the effects of the SCT constructs were not directly measured in this study. Other limitations of this study were that it did not include a random sample, it lacked a control group, and it was not a longitudinal study (Ha & Caine-Bish, 2009).

Environmental factors contributing to the dietary patterns of college students have also been studied to determine contributors of weight change. Brunt and Rhee (2008) conducted a cross-sectional study to examine the differences in dietary variety and BMI as they related to students' living arrangements. The study consisted of 585 student participants in a non-majors introductory nutrition class at a mid-western university in the United States. A Diet Variety Questionnaire was administered that included questions on height and weight, living arrangements, and a 3-day dietary recall section where the students reported foods eaten in the last three days (one weekend day and two week days). Dietetic students used 24-hour food records to validate dietary measures in this study. Descriptive statistics were calculated and univariate procedures tested the relationships between student residence with BMI, health behaviors, and various foods. Results revealed that students who lived off-campus in comparison to those who lived on-campus had increased health risks including a higher BMI, smoking, alcohol consumption, and a lower consumption of fruits, vegetables, and dairy products (Brunt & Rhee, 2008). Even though there are various factors that may contribute to these increased health risks, these results suggest a difference in dietary behaviors and the health of students based upon their living arrangements. While this study was able to depict differences, cross-sectional data does not allow for the determination of causality. Self-reported scales also could introduce potential recall bias.

Moczulski et al. (2007) conducted a cross-sectional study to evaluate the commuting behaviors of college students and overweight and obesity status. The study consisted of 496 students in a Personal Health 101 class at an ethnically diverse university in the western United States. The researchers created and conducted a

questionnaire regarding commuting behaviors, health behaviors, and reflections of youth behaviors based on a thorough literature review. Face validity was established by an expert panel review with scientific and technical training and publications in the health education field. Further validity and reliability was also established through the inclusion of questions from previously used instruments such as the Youth Risk Behavioral Surveillance Study (YRBSS) and the BRFSS. Descriptive statistics were used to determine frequencies, and binary logistical regression was used to determine the odds of being overweight with increased commute time and to determine the odds of eating in one's vehicle while commuting (Moczulski et al., 2007). Results revealed that students who reported commuting for 16 minutes or greater to get to campus were 64% more likely to be overweight and were more likely to eat while in their vehicle. The students who ate in their car were more likely to eat fast food and reported lower levels of physical activity (Moczulski et al., 2007). These results support the environment as a determining factor of nutrition habits, physical activity levels, and weight status of college students. Causality cannot be inferred in this study because it was cross-sectional, and generalizability was potentially limited since the study used self-report measures and only included students at one university.

Although the study conducted by Sands et al. (1998) was previously mentioned with the studies utilizing the HBM, the researchers also measured constructs of the SCT within the study (n=356). Please refer to the HBM section for details regarding the study and analyses. Results of this portion of the study revealed that self-efficacy was the strongest predictor for alcohol prevention behaviors, identity/confidence was the strongest predictor for AIDS-prevention behavior, and social influence had the

greatest effect on healthy eating behaviors of college students (Sands et al., 1998). The SCT concepts of self-efficacy and social influence were reported as influential predictors for all three health promoting behaviors. As previously mentioned, this study was limited by unvaried sample population, self-reported data, and the minimal large-scale use of the measures applied in the study.

Strong et al. (2008) conducted an investigative study to identify health behavior change targets related with weight management in college students. The study included 43 first and second year college students not majoring in human nutrition, foods, and exercise and who did not report suffering from depression, eating disorders, or major chronic diseases. The researchers used a mixed-methods approach with a series of assessments including the Health Beliefs Survey, Three-Factor Eating Questionnaire, and a questionnaire used to prioritize activities of college students along with elicitation interviews and focus groups to gather information on students' daily routine, diet, and physical activity. Objective measures were also obtained for body weight and composition, waist circumference, resting blood pressure, and cardiorespiratory fitness. Validity and reliability of study instruments were reported in previous studies and referenced by the authors. Descriptive statistics and Pearson's correlations were calculated for the variables using SPSS, and the elicitation interviews were analyzed to indentify major themes organized according to SCT components. Results revealed that mean blood pressure and body fatness were within a normal range, and students reported a decline in exercise and dietary habits upon entrance to college (Strong et al., 2008). The SCT constructs of social support, self-efficacy, and outcome expectations were associated with health behaviors in qualitative analyses, yet students lacked adequate

self-regulatory skills. The results of this study suggest that the SCT may be successfully applied to facilitate healthy behaviors in college students. This study could be strengthened with the use of a longitudinal study and the inclusion of a comparison/control group to control for the confounding factors that may exist. While qualitative data provides relevant information to interpret the phenomena and the discovery of meaning within a study, the significance of the findings and strength of relationships could not be examined (Harris, 2010).

Clifford et al. (2009) conducted a randomized controlled trial to determine if a series of SCT-driven cooking programs improved cooking self-efficacy, knowledge, attitudes, and behaviors regarding fruit and vegetable intake of college students living off campus. The study consisted of 101 students from upper-level non-health courses at a western university. Clifford et al. (2009) conducted an intervention in which participants in the intervention group viewed four 15-minute cooking programs (*Good Grubbin'*) over a four-week period and the control group viewed four 5-minute programs on sleeping disorders. All participants viewed these programs on the internet and completed three assessments (pre-, post-, and 4-month follow-up), where each assessment included a food frequency questionnaire (FFQ) and a personal factors survey. The participants also completed a five question survey after each episode to ensure the participant watched the entire program. Content validity of the personal factors survey was established through an expert panel and reliability of the FFQ was established through a test-retest method (α=0.5-0.8; Clifford et al., 2009). Various analyses were conducted to determine the effectiveness of the program including chi-square and *t*-tests, analysis of variance, and independent *t*-tests. Results revealed that there was a significant improvement in

knowledge for the intervention group and 61% of participants agreed that they would like to view more *Good Grubbin'* episodes (Clifford et al., 2009). Unfortunately, there was no significant change in the fruit and vegetable intake or cooking patterns in the intervention group. This study had a few limitations including selection bias, small sample size, and attrition.

Psychosocial and environmental determinants of eating behaviors, physical activity, and weight change among college students have also been studied to examine factors that might contribute to healthy and unhealthy behaviors. In one such study, LaCaille et al. (2011) used qualitative methods with six gender-specific focus groups and a total of 49 students recruited from a psychology course at a midwestern university. The focus groups were led by a trained doctoral student who asked open-ended questions related to past and present eating and physical activity habits, as well as the university's role in these behaviors (LaCaille et al., 2011). The analysis of the data included the transcription of the audio-recorded sessions, development of a coding system, and use of the qualitative software NVivo to identify themes, patterns, etc. within the data. Results from the discussions revealed that weight changes were dynamic and complex during college as both men and women discussed patterns of weight fluctuation. Results also revealed that both men and women cited a number of psychosocial and environmental factors associated with healthy and unhealthy eating and exercise behaviors (LaCaille et al., 2011). The psychosocial factors hindered the students' self-regulatory processes, which included motivation to eat healthy and exercise, self-control of consumption, and effective time-management skills. The environmental factors included cost, convenience, and availability of healthy options. Despite the valuable information gathered the study

has limited generalizability due to the small sample located at one university and since the information is self-reported it is subject to response bias.

Summary

Based upon the studies analyzed in this literature review evidence suggests that inclusion of theoretical constructs is necessary to implement successful college-based health interventions. Researchers of the studies in this literature review examined the TPB, HBM, TTM, and SCT as they related to weight change and nutrition behaviors among college students. Through the application of various theoretical constructs, methods, measures, and results the theories examined provide data in support for the growing concern of the increasing rate of college students gaining weight and adopting unhealthy nutrition behaviors. The TPB studies supported the relationships between college students' weight change and/or nutrition behaviors with individuals' attitude, perceived subjective norm, and PBC (Blanchard et al., 2009; Pawlak et al., 2009). Additionally, Soweid et al. (2003) found that college students' attitude and behavior were both impacted by a health awareness class. The HBM studies were effective in determining college students' future intention for healthy dietary behaviors through the application of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers of weight change and nutrition (McKinley, 2009; Von ah et al., 2004; Ronis, 1992; Sands et al., 1998). The TTM studies were effective in determining the stages of change that college students go through to adopt healthy dietary behaviors and prevent weight change (Racette et al., 2005; de Oliveira et al., 2005; Chung et al., 2006; Hu et al., 2011; Finckenor & Byrd-Bredbenner, 2000), increase health behaviors (Horneffer-Ginter, 2008), and to determine the impact of a health promotion course

(Soweid et al., 2003). Lastly, the SCT studies were effective in determining weight and behavioral changes among college students by examining students' associated personal factors, behavioral factors, and environmental (Ha & Caine-Bish, 2009; Brunt & Rhee, 2008; Moczulski et al., 2007; Sands et al., 1998; Strong et al., 2008; Clifford et al., 2009; LaCaille et al. 2011).

The TPB, HBM, TTM, and SCT were all studied based upon previous evidence of their effects on behavior change through the application of their constructs. The literature included in this studied revealed that these theories were successfully applied to determine weight change and behavioral changes in college students. In particular the SCT constructs of self-efficacy (Ha & Caine-Bish, 2009; Strong et al., 2008; Clifford et al., 2009), outcome-expectancy value, self-regulation (Ha & Caine-Bish, 2009; Strong et al., 2008), and one's perception of his/her social and physical environment (Ha & Caine-Bish, 2009; Brunt & Rhee, 2008; Moczulski et al., 2007; Strong et al., 2008; LaCaille et al. 2011) were related with weight and nutrition behaviors of college students. Due to the successful application of the SCT to behavior change, this study used the SCT to conduct further research of weight and nutrition behaviors of college students. In addition, the purpose of this study was to apply environment specific constructs of the SCT to provide a better understanding of the environmental influences of nutrition behaviors and weight change of college students. This study was conducted to further current research and provide insight into better understanding the roles of the SCT constructs environment (eating environment), situation (both the perceived social environment and perceived physical environmental barriers), and associated self-efficacy levels as they pertain to college students' weight change and nutrition behaviors.

Identifying individual and social environmental factors associated with weight gain and dietary behavior in college students may help researchers understand which changes are responsible for weight gain and develop an intervention to improve the health behaviors of the college population (Holm-Denoma et al., 2008). Continued research of the application of the SCT could provide compelling support for nutrition education, distribution of literature on weight change and nutrition behaviors, and interventions for all college students to improve their nutrition behaviors. The results of these studies could also be incorporated into current health behavior prevention and intervention strategies to make programs more relevant for students.

Measurement of SCT Constructs

The measures that were used in this study were included based upon their inclusion of the SCT constructs environment – eating, situation – perceived social environment, situation – perceived environmental barriers, and associated self-efficacy levels. These measures were included because 1) terminology and design of the questions and statements were applicable to college students, 2) they provided less invasive and intensive data collection for the participants in the study, 3) they provided lower response bias or omission from the participants, 4) they were easily converted to TeleForm (this is further explained in Chapter 3), and 5) they had been used to effectively research individual health behaviors.

The Freshman Weight Gain Survey (Levitsky et al., 2004) was used to measure the eating environment and the situation – perceived social environment (physical) of college students. The Freshman Weight Gain Survey was selected instead of the use of food records or qualitative measures such as focus groups, which are

commonly used to determine the environmental factors related with behavior, because this measure was previously used and provides college specific measures of weight change and nutrition behaviors. For specifics about the pre-existing options for measuring these constructs see Table 5.

The measure used to analyze the situation perceived environment (physical), of college students was the *Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HSBI*;Tucker et al., 2011). This measure was selected instead of other pre-existing options because validity had previously been demonstrated and it contains measures that directly pertain to the weight change and nutrition behaviors of college students. For specifics about the pre-existing options for measuring these constructs see Table 5.

The measure used to assess the associated self-efficacy levels of college students was the Weight Efficacy Life-Style Questionnaire (WEL; Clark et al., 1991). This measure was selected instead of other pre-existing options because validity was previously established and it contains items that directly pertain to the nutrition behaviors of college students. For specifics about the pre-existing options for measuring these constructs see Table 5.

Table 5.

Alternative Existing Measures.

Reference	Scale	Measures	Description
ACHA, 2009	ACHA	Nutrition intake	ACHA: Instrument to assess the behaviors of college students.

(Continued)

Reference	Scale	Measures	Description
BRFSS, 2009	BRFSS	Nutrition intake	BRFSS: Instrument to assess the nutrition intake of populations
Brunt, 2008	DVQ	Diet	Instrument to assess diet and health behaviors.
CDC, 2009	NHANES	Dietary behavior Nutrition	Instrument to assess the health and nutrition status of adults and children in the United States.
Edelstein, 2011	24-Hour Dietary Recall	Dietary intake	Instrument in which an individual records all the food eaten in the last 24 hours.
Edelstein, 2011	3-Day Recall	Dietary intake	Instrument in which an individual records all the food eaten in three days (two weekdays and one weekend day).
Glynn, 1986	ESES	Self-efficacy	Instrument to assess weight-loss self-efficacy of college students.
Holm-Denoma, 2008	HEPRQ	Health and eating patterns	Instrument to assess health habits.
Holm-Denoma, 2008	SSES	Self-esteem	Instrument to assess changes in self-esteem.
Jackson, 2007	Multi-Dimensional Support Scale	Social support	Instrument to assess the perceived social support from family and friends.
LaCaille, 2011	Focus group	Environment	Instrument to assess the psychosocial and environmental determinants of eating behaviors, physical activity, and weight change among college students.
Latimer, 2011	PANSE	Self-efficacy	Instrument to assess the weight-loss self-efficacy among women.

(Continued)

Reference	Scale	Measures	Description
Levitsky, 2004	Freshman Weight Gain Survey	Eating behaviors/environment Situation- perceived social environments	Instrument to assess the eating behaviors and social environments of college students.
McKinley, 2009	WMSI	Social support	Instrument to assess the social support for weight management.
Smith, 2008	SES	Self-efficacy	Instrument to assess self-confidence and personal mastery of behavior changes.
Stitch, 2009	DIET-SE	Dietary patterns	Instrument to assess/describe scenarios of eating temptations for dieting situation.
Strong, 2008	EAT	Diet	Instrument to assess diet and disordered eating.
Tucker, 2011	MB-HSBI	Situation - perceived environmental barriers	Instrument to assess the barriers to health behaviors.
Von Ah, 2004	SSQ6	Social support	Instrument to assess perceived availability of and satisfaction with social support.
Wengreen, 2009	FFQ	Dietary intake	Instrument to assess usual frequency of food items.

Notes. ACHA = American College Health Association; BRFSS = Behavioral Risk Factor Surveillance System; DVQ = Diet Variety Questionnaire; CDC = Center for Disease Control and Prevention; NHANES = National Health and Nutrition Examination Survey; ESES = Eating Self-Efficacy Scale; HEPRQ = Health and Eating Patterns Research Questionnaire; SSES = State Self-Esteem Scale; PANSE = Physical Activity and Nutrition Self-Efficacy; WMSI = Weight Management Support Inventory; SES: Self-Efficacy Scale; DIET-SE = dieter's inventory of eating temptations – self efficacy; EAT = Eating Attitude Test; MB-HSBI = Motivators of and Barriers to Health-Smart Behaviors Inventory; SSQ6 = Social Support Questionnaire; FFQ = Food Frequency Questionnaire

Conclusions

Given the support provided for the SCT and the need for a better understanding of the environmental factors related to weight change and nutrition behaviors of college students as well as the lack of research examining environment, further research is

needed to improve the health of college students. Therefore, the purpose of this study was to examine the nutrition behaviors and weight change of university students using the SCT. More specifically, this study aimed to describe the SCT constructs of situation, environment, and self-efficacy as they pertain to weight change and nutrition behaviors of college students. Potential differences in these factors across class years and between males and females were also examined.

CHAPTER THREE

Methodology

Introduction

Weight change and nutrition behaviors among college students have become major health concerns for universities around the nation. The BRFSS reported that the greatest increase in obesity rates was among individuals ages 18-29 with at least some college education (Wengreen & Moncur, 2009). According to Healthy People 2020, in order for an individual to maintain his/her health and weight he/she must adopt healthy nutrition behaviors. Based upon these recommendations, this study was designed to determine the influencing factors on the nutrition behaviors and weight change of college students utilizing the SCT. The SCT was included in this study based on behavior change potential through the application of the SCT constructs for college student behaviors and because the SCT has been successfully used previously to determine weight change and behavioral changes in college students. Interventions that incorporate constructs of the SCT may be effective to increase the healthy nutrition and physical activity behaviors of college students and prevent weight gain (Strong et al., 2008).

To better understand the influencing factors among college students, a classroom assessment instrument was used to collect data from a convenience sample of students enrolled in courses at the institution where the study was conducted. The assessment instrument included items pertaining to socio-demographics; scales to assess SCT

constructs (i.e. self-efficacy, self-regulation, outcome expectations, situation – perceived social environment and social norms); and questions targeting nutrition behaviors and participation in physical activity (See Assessment Instrument section for more details). Study participants also participated in objective height and weight measurements to provide objective measurements of weight and weight change.

Purpose

The purpose of this study was to examine nutrition behaviors and weight change of college students using constructs from the SCT, specifically environment, situation, and self-efficacy. More specifically, this study investigated the SCT constructs of environment, situation, and self-efficacy in regards to nutrition behavior, weight, and weight change among a sample of college students. A secondary aim of this study was to examine potential weight change and nutrition behavior differences by gender and across the class years (1st year, 2nd year, 3rd year, and 4th year or greater). This research targeted the weight and nutrition behaviors of college students, which provides information to guide tailoring of marketing and educational strategies within university settings.

Research Questions

In order to examine weight change and nutrition behavior of college students, the following research questions were examined:

1. What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1st year, 2nd year, 3rd year, and 4th year or greater)? Are there differences in nutrition behaviors between male and female college students?

2. Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?
3. What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Participants

A convenience sample of undergraduate students enrolled in the general health class, "Health and Human Behaviors," and those over the age of 18 years completed the assessment instrument (n=444). "Health and Human Behaviors" is a course housed within the Department of Health, Human Performance, and Recreation Department within the School of Education at Baylor University. According to university records, a total of 606 students were enrolled in HED 1145 during fall 2012, the semester data for this research was collected.

Assessment Instrument

In order to assess the nutrition behaviors and weight change among college students and potential confounders of relationships of interest, the assessment instrument contained questions including demographics, weight status, SCT constructs, nutrition behaviors, physical activity, alcohol use, and tobacco use (see Appendix A). Select questions from the following instruments were used: Freshman Weight Gain Survey as developed by Levitsky et al. (2004), the Weight Efficacy Life-Style Questionnaire (WEL) developed by Clark et al. (1991), the American College Health Association-

National College Health Assessment (ACHA-NCHA) (ACHA, 2009), the Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HSBI) developed by Tucker et al. (2011) and the BRFSS (BRFSS, 2009). Items and measure characteristics are included in Table 6.

Outcome Variables

Weight status. Weight status measurement consisted of objective height and weight measures that were conducted by trained research staff. The staff used reliable scales (SECA Models 876 and 437) and stadiometers (SECA Model 217) created by SECA Medical Scales and Measuring Systems. There were two data collection points for the height and weight measurements. The first data collection point was at the beginning of the semester and the second data collection point was six weeks later. The weight measures were recorded to the nearest 0.1 pound, if there were two decimal places on the scale, the measure was rounded to the nearest 0.1 pound. If the decimal number was 0.05 or greater the measure was rounded up to the nearest 0.1 pound and if the decimal number was less than 0.05 the measure was rounded down to the nearest 0.1 pound. For example: If the scale read 135.24, the measure was recorded as 135.2 and if the scale read 135.26, the measure was recorded as 135.3. The height measures were rounded to the nearest quarter inch using decimals (0.25). The measures were rounded up or down to the nearest quarter inch based on the 1/8 inch mark between each quarter inch mark on the stadiometer. For example: If the stadiometer read 5'3 1/8", the measure was recorded as 5' 3.0" and if the stadiometer read 5'3 5/8", the measure was recorded as 5' 3.75". The stadiometer measures were converted as follows: if the height was < 1/8 = .0, if the

height was ≥ 1/8 & < 3/8 = 0.25, if the height was ≥ 3/8 & < 5/8 = 0.5, if the height was ≥ 5/8 & < 7/8 = 0.75 and if the height was ≥ 7/8 then round up by 1".

Objective height and weight measurements were used to create a new variable, BMI. BMI is a number calculated from a person's weight and height that provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (CDC, 2011a). Although BMI does not directly measure body fat, BMI is considered an alternative for direct measures of body fat based on research that has shown that BMI correlates to measures of body fat such as submersion and dual energy x-ray absorptiometry (DXA; CDC, 2011a). Calculating BMI is an inexpensive and easy-to-perform method to determine weight associated health problems, it is one of the best methods for population assessments, and it allows people to compare their weight status to that of the general population (CDC, 2011a). The following formula was used to calculate the BMI variable (CDC, 2011a);

$$BMI = [\text{Mass in Pounds} / (\text{Height in inches})^2] \times 703$$

Consumption size. Eating behaviors of college students were measured using eating behavior items from the Freshman Weight Gain Survey developed by Levitsky, Halbmaier, and Mrdjenovic (2004). These items measure current snack, breakfast, lunch and dinner eating behaviors of college students and provide a comparison to the previous semester and/or high school. The Freshman Weight Gain Survey is a 51-item survey previously used to study factors associated with weight gain (Levitsky, Halbmaier, & Mrdjenovic, 2004). The questionnaire measures students' lifestyle factors related to eating, sleeping, and exercising habits during the preceding semester. There were two questionnaires used during the study, the first obtained information about the student's

lifestyle during high school and the second (twelve weeks later) obtained information about the student's lifestyle factors related to eating, sleeping, and exercising habits during the preceding semester. The first questionnaire served as an internal validity check, while the results from the second questionnaire were used in the analyses (Levitsky et al., 2004). Levitsky et al. (2004) reported that there was a significant weight gain across the twelve weeks (p=0.01). For this study, consumption size was measured using three eating behavior items from Levitsky's Freshman Weight Gain Survey, which included, "What was the average size of your breakfast," "What was the average size of your lunch," and "What was the average size of your dinner?" (Levitsky et al, 2004). The participants reported the size of their meals as 1) light, 2) moderate, 3) large, or 4) skipped or did not eat (Levitsky et al., 2004). Summary scores were computed for each variable to report the average size of each meal (breakfast, lunch, and dinner). A mean summary score was then computed to report the average size of all meals consumed (breakfast, lunch, and dinner).

Fruit and vegetableiIntake. Nutrition intake was measured using one item from the ACHA-NCHA, 2009. The *ACHA-NCHA II* is a nationally recognized 65-item research survey created by the ACHA to collect precise data about students' health habits, behaviors, and perceptions (ACHA, 2009). The ACHA-NCHA was pilot tested in 1998-1999 and evaluated with reliability and validity analyses comparing the survey items to national studies such as the National College Health Risk Behavior Survey, Harvard School of Public Health 1999 College Alcohol Study, and the United States Department of Justice: The National College Women Sexual Victimization Study (ACHA, 2009). After the utilization of a series of comparisons and statistical analyses

(triangulation) the ACHA-NCHA appeared to be both reliable and valid and of empirical value for representing American college students (ACHA, 2009). The item included in this study measures consumption of fruits, vegetables, and legumes on a daily basis. Specifically, the item states, "How many servings of fruits and vegetables do you usually have per day? (1 serving = 1 medium piece of fruit; 1⁄2 cup fresh, frozen, or canned fruits/vegetable; 3⁄4 cup fruit/vegetable juice; 1 cup salad greens; or 1⁄4 cup dried fruit)" (ACHA, 2009).

Predictor Variables

Situation - perceived environmental barriers. Perceived environmental barriers were measured using items regarding healthy food and snack barriers from Tucker et al. (2011) *Motivators of and Barriers to Health-Smart Behaviors Inventory (MB-HSBI)*. The MB-HSBI was designed to identify motivators of and barriers to the targeted adult health-smart behaviors (Tucker et al., 2011). The MB-HSBI includes eight items: Healthy Breakfast–Motivators, Healthy Breakfast–Barriers, Healthy Foods and Snacks–Motivators, Healthy Foods and Snacks–Barriers, Healthy Drinks–Motivators, Healthy Drinks– Barriers, Physical Activity–Motivators, and Physical Activity– Barriers. For this study, the *availability* subscale of the Healthy Foods and Snacks –Barriers was used to capture situation in the form of perceived barriers to eating healthy food and snacks. The *self-control* and *negative attitudes* subscales of the Healthy Foods and Snacks – Barriers scale were not used in this study. Wording of the items in this subscale reflect snack and non-snack food intake. Specifically, the three questions from the *Availability* subscale stated, "When I do not eat healthy foods (like fruits, vegetables, and lower calorie

snacks), it is because…1)…fresh healthy foods are not easily available, 2)…I cannot get healthy snacks in the snack machines, and 3)…health foods are not easy to find at restaurants." The respondent was asked to rate his/her agreement with the items on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). A subscale score was calculated by summing responses for the three items. Internal consistency (α) of this questionnaire's score was previously estimated to be between 0.78 and 0.92; Healthy Foods and Snacks: barriers subscale (α=0.85); Availability subscale (α=0.70; Cronbach, 1951; Tucker et al., 2011). Convergent validity of the Healthy Foods and Snacks questionnaire's score was previously determined by examining correlations between motivator subscales and barrier subscale scores (Tucker et al., 2011). Concurrent validity was also previously supported by examining the association between MB-HSBI scale scores and Physical Health subscale scores of the School of Health Efficacy Questionnaire and the Health-Smart Behavior Goal Agreement Ratings. The analyses and internal consistency results supported multiple scales and associated subscales to measure the motivators of and barriers to each of the targeted health-smart behavior domains. Tucker et al. (2011) reported that the scores were correlated with health self-efficacy and with the importance of health-related behavioral goals.

Situation - perceived social environment. Perceived social environment was measured using three eating behavior items from the Freshman Weight Gain Survey developed by Levitsky et al. (2004). These items measure the perceived social environment of the current breakfast, lunch, and dinner eating behaviors of college students. A full description of the Freshman Weight Gain Survey is provided previously in this section. For this study, only the eating items were utilized, which included,

"Average number of people with whom you ate breakfast," "Average number of people with whom you ate lunch," and "Average number of people with whom you ate dinner?" (Levitsky et al., 2004). The participants listed the average number of people with whom they ate their meals. Summary scores were computed for each item to report the average number of people with whom the participants ate each meal (breakfast, lunch, and dinner). A mean summary score was computed to report the average number of people with whom the participants ate all their meals (breakfast, lunch, and dinner).

Eating environment. Eating environment was measured using nine eating behavior items from the Freshman Weight Gain Survey developed by Levitsky et al. (2004). These items measured the eating environment of the current breakfast, lunch, and dinner eating behaviors of college students. A full description of the Freshman Weight Gain Survey is provided previously in this section. For this study, only the eating items were utilized, which included, "Number of times per week you prepared yourself breakfast…lunch…dinner…(in room, kitchen, etc.)," " Number of times per week you are your breakfast…lunch…dinner… at a restaurant," and "Number of times per week you are your breakfast…lunch…dinner…at an all-you-can-eat dining hall?" (Levitsky et al., 2004). The participants listed the number of times they ate their meals at either of the above-mentioned locations. Responses for eating in a dining hall of 21 or greater times per week were recoded as 21 based upon the assumption that most individuals eat three meals per day. Summary scores were computed for each item to report the use of the three eating environments per week (preparing meals, eating ate a restaurant, and eating at a dining hall).

Self-Efficacy for eating behaviors. Self-efficacy is one's beliefs about personal ability to perform a behavior (Bandura, 1977; McAlister et al., 1996). Self-efficacy for eating behaviors was measured using two subscales of the twenty-item WEL developed by Clark and colleagues (1991): availability and social pressure. The twenty-item Weight Efficacy Life-Style Questionnaire (WEL) was originally developed to examine how self-efficacy could be utilized as a mechanism to understand the treatment of obesity (Clark et al., 1991). The WEL was designed on the basis of a clinical experience to be administered to a sample of obese patients in a 14-session structured weight loss program at the workplace. The WEL measures a participant's confidence about being able to resist the desire to eat based upon five situational factors: negative emotions, availability of foods, social pressure to eat, physical discomfort, and positive emotions. For this study items from the availability and social pressure subscales were included. The four questions from the availability subscale included, 1) "I can control my eating on the weekends, 2) I can resist eating when there are many different kinds of food available, 3) I am at a party, and 4)) high-calorie foods are available," and the four questions from the social pressure subscale included, "I can resist eating when 1) I have to say "no" to others, 2) I feel it's impolite to refuse a second helping, 3) other are pressuring me to eat, and 4) I think others will be upset if I don't eat;" (Clark et al., 1991). Participants rated their confidence on a Likert scale from 0 (not confident) to 9 (very confident). Subcale scores were calculated by summing the four items for each of the two situational subscales (Clark et al., 1991). Previously reported internal consistency (α) for the twenty-item scale ranged from 0.90 to 0.70 (Cronbach, 1951; Clark et al., 1991). Previous internal consistency (α) for the availability subscale ranged from 0.76 to 0.83

and for the social pressures subscale ranged from 0.89 to 0.90 (Cronbach, 1951; Clark et al., 1991). The original five-factor model was also cross-validated using scale means, standard deviations, correlations, and internal consistency (Clark et al., 1991). External validity has previously been determined with two treatment sample groups to compare and determine if there were correlations between the WEL total and subscale scores and the Eating Self-Efficacy Scale (ESES; Clark et al., 1991). Clark et al. (1991) reported that the WEL was significantly correlated with the ESES.

Sample Description and Potential Confounding Variables

Several health behaviors were calculated and reported to describe the sample (please see below).

Demographic variables. The present study used twelve questions from the demographic characteristics section of the ACHA-NCHA II. A full description of the ACHA-NCHA was provided previously in this section. Questions included were age, gender, height, weight, classification, enrollment status, ethnicity, relationship status, residence (on or off campus), social fraternity/sorority (Greek) affiliation, employment, and approximate grade point average (GPA). The ACHA-NCHA is a public domain scale.

Physical activity. Physical activity was measured using four physical activity items from the BRFSS (BRFSS, 2009). The BRFSS is a multiple-item survey established by the CDC to collect information on health risk behaviors, preventive health practices, and health care access (CDC, 2009). The CDC developed the BRFSS as a standards core questionnaire to be used as a state-based system of health surveys that serves as an

available source of accurate data of health-related behaviors for all 50 states. There have been approximately twenty studies that have examined issues related to the reliability and validity of the BRFSS most of which have determined that most questions were moderately reliable and valid and many questions were highly reliable and valid (Nelson et al., 2001). The BRFSS items included in this study measure participants' current physical activity behaviors, including moderate intensity and vigorous intensity physical activities. Specifically, these items include questions such as, "On days when you do moderate…vigorous… activities for at least ten minutes at a time, how much total time do you spend doing these activities," and " How many days per week do you do these moderate…vigorous…activities for at least ten minutes at a time" (Nelson et al., 2001). A summary score was computed for the total time spent participating in moderate physical activity per week, and a summary score was also computed for the total time spent participating in vigorous physical activity per week.

Alcohol use. Alcohol use was measured using one item from the ACHA-NCHA (2009). A full description of the ACHA-NCHA was provided previously in this section. This item measures the consumption and patterns of alcohol use. As alcohol use is directly related with weight status, it is imperative to measure this information (ACHA, 2009). Specifically, these items include, "Within the last 30 days, on how many days did you use: Alcohol?" (ACHA, 2009).

Tobacco use. Tobacco use was measured using four items from the ACHA-NCHA (2009). A full description of the ACHA-NCHA was provided previously in this section. These items measure types and patterns of tobacco use. Specifically, the items

included in this study were, "Within the last 30 days, on how many days did you use: cigarettes…tobacco from a water pipe (hookah)…cigars, little cigars, clove cigarettes…smokeless tobacco?" (ACHA, 2009). A summary score was computed to determine the total use of tobacco products in the past 30 days.

Tasks	Months								
Aug 2011 – April 2012	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April
IRB Approval	X								
Data Collection		X	X						
Chapters 1-3			X	X					
Proposal Defense					X				
Quantitative Analyses					X	X			
Chapters 4 and 5						X	X		
Submit to Committee							X		
Defense								X	
Final Editing								X	
Submit Final Version									X

Figure 1. Project Timeline for the Thesis.

Table 6.

Theoretical Framework and Behavioral Assessment Subscales.

	Reference	Measures	Variables	Validity/ Reliability	Number of Items	Scale
Outcome Variables	CDC, 2011a	BMI	Weight and height measurements	Previously tested*	2	[Weight in Pounds / (Height in inches)^2] x 703
	Levitsky, 2004	Nutrition intake	Meal consumption size for breakfast, lunch, and dinner	Previously tested*	3	Light Moderate Large Skipped/did not eat
	ACHA, 2009	Nutrition intake	Fruit and vegetable consumption per day	Previously tested*	1	0 servings 1-2 servings 3-4 servings 5 or more servings
Predictor Variables	Tucker, 2011	Perceived environmental barriers	Availability barriers	α=0.78 to 0.92	3	Likert-type scale from 1 (strongly disagree) to 4 (strongly agree)
	Levitsky, 2004	Perceived social environments	Eating and social environment for breakfast, lunch, and dinner	Previously tested*	6	Number of times prepared meal, ate at a restaurant, or ate at a dining hall Number of people with whom ate each meal
	Clark, 1991	Eating behaviors self-efficacy	Social pressure Availability	α=0.90 to 0.70	8	Likert-type scale from 0 (not confident) to 9 (very confident)

(Continued)

	Reference	Measures	Variables	Validity/ Reliability	Number of Items	Scale
Sample Description and Potential Confounding Variables	ACHA, 2009	Demographic Information	Gender Ethnicity Age Year in College Enrollment Status GPA Greek Affiliation Residence Relationship Status Employment	Previously tested*	12	Selected the most applicable responses.
	BRFSS, 2009	Physical activity	Moderate and vigorous PA per day Days per week	Previously tested*	4	Reported hours and/or minutes Days per week
	ACHA, 2009	Alcohol use Tobacco use	Alcohol use and tobacco use in the last 30 days	Previously tested*	8	Never used Have used but not in the last 30 days 1-2 days 3-5 days 6-9 days 10-19 days 20-29 days Used daily

Notes. *Previously tested and reported as valid and reliable; CDC = Center for Disease Control and Prevention; ACHA = American College Health Association; BRFSS = Behavioral Risk Factor Surveillance System; GPA = grade point average; PA = physical activity

Procedure

This research was approved by the Institutional Review Board (IRB) of the university in which the research was conducted (IRB # 260196-1; see Appendix C). Data collection occurred in September and October of the 2011 fall semester (see Figure 1 for the project timeline). At the beginning of each class, a research team member briefly explained the project to potential participants (see Appendix D for Proctor Instructions). The potential participants were informed that participation was voluntary and that the research was completely confidential. Participant consent was indicated by completion and submission of the informed consent form (See Appendix B). A third party researcher with no access to the student participants' grades recruited students for participation in the study. The course instructors for all sections of Health and Human Behaviors were not present for data collection, nor had knowledge of which student participants agreed to participate in the study and which students declined to participate in the study. A pilot test of the assessment instrument indicated that it would take approximately 20-25 minutes to complete (n=2). There were no incentives for participants to complete the assessment instrument.

Statistical Analysis

Data was entered, cleaned, and analyzed using SPSS v19 statistical software. The survey was designed using Teleform Designer which is a computer software designed to assist with the development of automated forms for processing and document capture (Autonomy Cardiff, 2009). The computerized version of the survey provides for 100% computerized verification of the entered data. Using a Fujitsu fi-6130 scanner, the completed surveys were scanned into the Teleform database to be verified with the

Teleform Verifier, which prompts the correction of any information that is not sufficiently evaluated by the Teleform Reader (Autonomy Cardiff, 2009). After scanning was complete, a 10% random check was conducted with surveys to ensure accurate data entry and verification. Descriptive statistics were conducted and reported for the sample. Data analysis for this study included the following for each of the research questions.

Research Question 1

What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1^{st} year, 2^{nd} year, 3^{rd} year, and 4^{th} year or greater)? Are there differences in nutrition behaviors between male and female college students?

Frequencies, means, and standard deviations were computed to describe baseline BMI measurements and nutrition behaviors. The data was tested to determine if the variables were normally distributed based on Q-Q Plots, histograms, skewness, and kurtosis (David, 1995; Moors, 1986; Walker, 1929). The following variables were used as continuous variables: average meal size consumption and BMI. The following variables were used as categorical variables gender, class, and fruit and vegetable servings per day. For normally distributed data the appropriate tests were performed including one way analysis of variance (ANOVA) and multinomial logistic regression model. The multinomial logistic regression model was performed to examine differences in fruit and vegetable servings consumed per day (a categorical variable) across class years and between males and females.

Research Question 2

Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?

Frequencies, means, and standard deviations were computed to describe the BMI measurements for the first and second height and weight measurements and the overall BMI change. The data was tested to determine if the variables were normally distributed based on Q-Q Plots, histograms, skewness, and kurtosis (David, 1995; Moors, 1986; Walker, 1929). The following variables were used as continuous variables: BMI time 1, BMI time 2, and BMI change (BMI time 2 – BMI time 1; [BMI 2 – BMI 1]). The gender and class variables were treated as categorical. Change scores were calculated for each class year and gender to describe the sample. BMI was reported descriptively for class year and gender. For normally distributed data the appropriate tests would include a repeated measures ANOVA. For continuous variables found to not be normally distributed, multivariate tests and tests of between-subjects effects were conducted to examine differences in BMI change across class year and gender.

Research Question 3

What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Frequencies, means, and standard deviations were computed to describe baseline SCT constructs to include baseline perceived social and physical environment factors and

associated self-efficacy levels. The data was tested to determine if the variables were normally distributed based on Q-Q Plots, histograms, skewness, and kurtosis (David, 1995; Moors, 1986; Walker, 1929). The following variables were continuous variables: 1) the average number of people with whom a student ate meals per week, 2) the total number of meals a student prepared per week, 3) the total number of meals a student ate at a restaurant per week, 4) the total number of meals a student ate at a dining hall per week, 5) the availability barriers that prevent a student from eating healthy foods, 6) the self-efficacy of students with regards to availability of healthy foods, and 7) the self-efficacy of students with regards to social pressures and making healthy food choices. Both class year and gender were categorical. For normally distributed data the appropriate tests to be performed would include one way ANOVAs. For continuous variables found to not be normally distributed, nonparametric Mann-Whitney U tests and Kruskal Wallace tests were conducted to examine differences across class year and gender (Kruskal, 1957).

CHAPTER FOUR

Results

Introduction

The purpose of this study was to examine nutrition behaviors and weight change of college students using constructs from the SCT, specifically environment, situation, and self-efficacy. More specifically, this study investigated the SCT constructs of environment, situation, and self-efficacy in regards to nutrition behavior, weight, and weight change among a sample of college students (*n*=444) from a university in the south central United States. A secondary aim of this study was to examine potential weight change and nutrition behavior differences by gender and across class years (1st year, 2nd year, 3rd year, and 4th year or greater). Data of interest was collected via a classroom based self-report assessment instrument and objective height and weight measures. The assessment instrument contained questions related to weight and nutrition behaviors of college students using specific SCT constructs.

Research Questions

In order to examine weight change and nutrition behavior of college students, the following research questions were examined:

1. What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1st year, 2nd year, 3rd year, and 4th year or greater)? Are there differences in nutrition behaviors between male and female college students?

2. Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?
3. What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Descriptive Statistics

The total sample size for this study was 444. Assessment instruments were disseminated to all general studies health courses during the fall 2011 semester (n=606). Of the disseminated assessment instruments 506 were returned and the participants also completed the objective height and weight measurement on the same day. Participants were excluded from the study if he/she was not at least 18 years of age (n=2), gender was not reported (n=57), and/or the participant reported not being an undergraduate college student (n=3). To answer the second research question, a second objective height and weight measurement occurred six weeks later in the fall semester (late October, 2011). After matching the data, only 365 participants completed both the baseline assessment and measures and the second objective height and weight measurement. Therefore, the baseline sample of 444 was used to answer the first and third research questions, and the matched sample of 365 was used to answer the second research question.

Baseline Sample Description

The baseline sample consisted of 444 undergraduate students enrolled in classes during the fall 2011 at a private, mid-sized university in the south central United States.

Approximately half of the sample was female (*n*=255; 57.4%). With regard to ethnicity, the sample was predominantly white (*n*=293; 66.1%), Hispanic (*n*=56; 12.6%), Black (*n*=39; 8.8%), or Asian (*n*=39; 8.8%). Only participants who were ages 18 and older were included in the analyses (*n*=444). The mean (μ) age was 19.88 with a standard deviation (*sd*) = 2.449. The majority of the sample reported being in their second year (*n*=244; 55%), 24.1% in their third year (*n*=107), 14% in their fourth or fifth year (*n*=62), and 7.0% in their first year (*n*=31). The majority of the sample reported their enrollment status as full-time (*n*=430; 100%). The majority reported living in an apartment complex (*n*=248; 55.9%), 16.2% lived in a rental house in a neighborhood (*n*=72), 16% lived in a campus residence hall (*n*=71), 5.9% lived in other off-campus housing (*n*=26), 4.1% lived in other university housing (*n*=18), and 2.0% lived with a parent or guardian (*n*=9). Please see Table 7 for sample characteristics for the overall sample and by gender and Table 8 for sample characteristics across class years.

Table 7.

Demographic Characteristics of the Overall Sample and by Gender.

Characteristic	Overall Sample *n*(%) or μ(*sd*)	Males *n*(%) or μ (*sd*)	Females *n*(%) or μ (*sd*)
Gender	(*n*=444)		
Male	189 (42.6%)	189 (42.6%)	-
Female	255 (57.4%)	-	255 (57.4%)
Ethnicity	(*n*=443)	(*n*=189)	(*n*=254)
White	293 (66.1%)	128 (67.7%)	165 (65%)
Black	39 (8.8%)	15 (7.9%)	24 (9.4%)
Hispanic/Latino	56 (12.6%)	24 (12.7%)	32 (12.6%)
Asian/Pacific Islander	39 (8.8%)	18 (9.5%)	21 (8.3%)
Other	16 (3.6%)	4 (2.2%)	12 (4.7%)
Age	(*n*=444)	(*n*=189)	(*n*=255)
	19.88 (2.45)	20.24 (2.76)	19.62 (2.16)

(Continued)

Characteristic	Overall Sample	Males	Females
	n(%) or μ(*sd*)	*n*(%) or μ (*sd*)	
Year in School	(*n*=444)	(*n*=189)	(*n*=255)
First Year	31 (7%)	10 (5.3%)	21 (8.2%)
Second Year	244 (55%)	102 (54%)	142 (55.7%)
Third Year	107 (24.1%)	44 (23.3)	63 (24.7%)
Fourth/Fifth Year	62 (14%)	33 (17.5%)	29 (11.4%)
Enrollment Status	(*n*=430)	(*n*=183)	(*n*=247)
Full-time	430 (100%)	183 (100%)	247 (100%)
GPA	(*n*=397)	(*n*=158)	(*n*=239)
A	145 (36.5%)	45 (28.5%)	100 (41.8%)
B	205 (51.6%)	90 (57%)	115 (48.1%)
C	44 (11.1%)	21 (13.3%)	23 (9.6%)
D/F	3 (0.8%)	2 (1.3%)	1 (0.4%)
Greek Affiliation	(*n*=430)	(*n*=180)	(*n*=250)
Yes	111 (25.8%)	34 (18.9%)	77 (30.8%)
No	319 (74.2%)	146 (81.1%)	173 (69.2%)
Residence	(*n*=444)	(*n*=189)	(*n*=255)
Campus Residence Hall	71 (16%)	18 (9.5%)	53 (20.8%)
Other College/University Housing	18 (4.1%)	9 (4.8%)	9 (3.5%)
Parent/Guardian's Home	9 (2.0%)	2 (1.1%)	7 (2.7%)
Apartment Complex	248 (55.9%)	110 (58.2%)	138 (54.1%)
Rental House within a Neighborhood	72 (16.2%)	35 (18.5%)	37 (14.5%)
Other Off-Campus Housing	26 (5.9%)	15 (7.9%)	11 (4.3%)
Relationship Status	(*n*=444)	(*n*=189)	(*n*=255)
Yes	153 (34.4%)	64 (33.9%)	89 (34.9%)
No	291 (65.5%)	125 (66.1%)	166 (65.1%)
Employment – Work for Pay	(*n*=444)	(*n*=189)	(*n*=255)
Yes	141 (32%)	61 (32.3%)	80 (31.4%)
No	303 (68.2%)	128 (67.7%)	175 (68.6%)
Moderate Physical Activity Minutes Per Week	(*n*=321) 414.13 (551.95)	(*n*=147) 425.44 (416.33)	(*n*=174) 404.57 (645.78)
Vigorous Physical Activity Minutes Per Week	(*n*=316) 268.98 (679.14)	(*n*=135) 350.96 (385.83)	(*n*=181) 207.83 (829.17)
Alcohol Use*	(*n*=439)	(*n*=187)	(*n*=252)
Yes	214 (48.8%)	113 (60.5%)	101 (40.1%)
No	225 (51.3%)	74 (39.5%)	151 (59.9%)
Tobacco Use*	(*n*=442)	(*n*=188)	(*n*=254)
Yes	55 (12.4%)	47 (25.1%)	8 (3.2%)
No	387 (87.7%)	141 (75%)	246 (96.8%)

Notes. Sample sizes vary due to missing data; *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; Ethnicity Other = American Indian, Alaskan Native, or Native American, Biracial or multiracial, and Other; GPA = Grade Point Average; *Alcohol and Tobacco Use is based on the last 30 days

Table 8.
Demographic Characteristics of the Sample across Class Years.

Characteristic	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (*sd*)		
Year in School (*n*=444)				
First Year	31 (7%)	-	-	-
Second Year	-	244 (55%)	-	-
Third Year	-	-	107 (24.1%)	-
Fourth/Fifth Year	-	-	-	62 (14%)
Gender (*n*=444)	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
Male	10 (32.3%)	102 (41.8%)	44 (41.1%)	33 (53.2%)
Female	21 (67.7%)	142 (58.2%)	63 (58.9%)	29 (46.8%)
Ethnicity (*n*=443)	(*n*=31)	(*n*=243)	(*n*=107)	(*n*=62)
White	27 (87.1%)	169 (69.5%)	53 (49.5%)	44 (71%)
Black	-	16 (6.6%)	20 (18.7%)	3 (4.8%)
Hispanic/Latino	1 (3.2%)	32 (13.2%)	15 (14%)	8 (12.9%)
Asian/Pacific Islander	3 (9.7%)	15 (6.2%)	14 (13.1%)	7 (11.3%)
Other	-	11 (4.5%)	5 (4.7%)	-
Age (*n*=444)	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
	18.55 (1.48)	19.14 (0.61)	20.65 (3.17)	22.15 (3.76)
Enrollment Status (*n*=430)	(*n*=31)	(*n*=234)	(*n*=105)	(*n*=60)
Full-time	31 (100%)	234 (100%)	105 (100%)	60 (100%)
GPA (*n*=397)	(*n*=29)	(*n*=219)	(*n*=98)	(*n*=51)
A	20 (69%)	82 (37.4%)	33 (33.7%)	10 (19.6%)
B	9 (31%)	113 (51.6%)	51 (52%)	32 (62.7%)
C	-	22 (10%)	14 (14.3%)	8 (15.7%)
D/F	-	2 (0.9%)	-	1 (2.0%)
Greek Affiliation (*n*=430)	(*n*=31)	(*n*=238)	(*n*=102)	(*n*=59)
Yes	-	63 (26.5%)	32 (31.4%)	16 (27.1%)
No	31 (100%)	175 (73.5%)	70 (68.6%)	43 (72.9%)

(Continued)

Characteristic	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (*sd*)		
Residence (*n*=444)	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
Campus Residence Hall	30 (96.8%)	26 (10.7%)	13 (12.1%)	2 (3.2%)
Other College/University Housing	-	10 (4.1%)	6 (5.6%)	2 (3.2%)
Parent/Guardian's Home	-	3 (1.2%)	3 (2.8%)	3 (4.8%)
Apartment Complex	-	158 (64.8%)	54 (50.5%)	36 (58.1%)
Rental House within a Neighborhood	1 (3.2%)	37 (15.2%)	24 (22.4%)	10 (16.1%)
Other Off-Campus Housing	-	10 (4.1%)	7 (6.5%)	9 (14.5%)
Relationship Status (*n*=444)	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
Yes	12 (38.7%)	72 (29.5%)	37 (34.5%)	32 (51.6%)
No	19 (61.3%	172 (70.5%)	70 (65.4%)	30 (48.4%)
Employment - Work for Pay (*n*=444)	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
Yes	3 (9.7%)	63 (25.7%)	46 (43%)	29 (46.7%)
No	28 (90.3%)	181 (74.2%)	61 (57%)	33 (53.2%)
Moderate Physical Activity (*n*=321)	(*n*=24)	(*n*=170)	(*n*=74)	(*n*=53)
Minutes Per Week	350.83 (240.96)	396.15 (552.98)	399.12 (474.16)	521.42 (724.34)
Vigorous Physical Activity (*n*=316)	(*n*=24)	(*n*=164)	(*n*=77)	(*n*=51)
Minutes Per Week	231.67 (277.45)	225.45 (298.69)	249.29 (408.08)	456.27 (1510.98)
Alcohol Use (*n*=439)	(*n*=31)	(*n*=241)	(*n*=105)	(*n*=62)
Yes	3 (9.7%)	114 (47.3%)	49 (46.6%)	48 (77.3%)
No	28 (90.3%)	127 (52.7%)	56 (53.4%)	14 (22.6%)
Tobacco Use (*n*=442)	(*n*=31)	(*n*=243)	(*n*=107)	(*n*=61)
Yes	2 (6.4%)	32 (13%)	10 (9.3%)	11 (17.8%)
No	29 (93.5%)	211 (86.8%)	97 (90.6%)	50 (82%)

Notes. Sample sizes vary due to missing data; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; Ethnicity Other = American Indian, Alaskan Native, or Native American, Biracial or multiracial, and Other; GPA = Grade Point Average; *Alcohol and Tobacco Use is based on the last 30 days

All variables of interest were then examined to determine if they were normally distributed based on Q-Q Plots, histograms, skewness, and kurtosis (David, 1995; Moors, 1986; Walker, 1929). Based on these assessments, BMI; average meal size consumption; average number of people with whom a participant ate meals; average number of times a participant prepared his/her own meal, ate at a restaurant, and ate at a dining hall; perceived access barriers; and self-efficacy variables were treated as continuous (please see Tables 28 and 29 for descriptive characteristics of these dependent variables). Average meal size consumption, number of people with whom a participant ate meals, perceived access barriers, and self-efficacy variables had normal distributions. Although continuous, based on these tests of normality, average number of times a participant prepared a meal, ate at a restaurant, or ate at a dining hall did not have normal distributions. Therefore, non-parametric statistics were conducted when examining these as dependent variables (Kruskal, 1957). BMI data was also positively skewed. In further examination of the data, the skewness was mostly influenced by a few outliers within the dataset. Therefore, both the baseline and follow-up BMI measurements were corrected for these gross errors by windzorizing using the 99th percentile. Windzorizing has been used to eliminate and replace the highest or lowest values with the next highest or lowest values to correct for errors in distributions (Umstattd et al., 2008). Windzorizing has been described more completely in previous studies (Umstattd et al., 2006). The windzorizing information used for the 99th percentile for baseline and follow-up BMI scores was 44.97 and 46.59, respectively. Three cases were replaced through windzorizing for baseline BMI and three cases were replaced for the follow-up BMI measurement. Sample characteristics were reported to describe baseline BMI

measurements prior to windzorizing (see Table 9) and windzorized variables were used in further analyses. Gender, class, and fruit and vegetable consumption were treated as categorical variables in all analyses.

Research Question 1

What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1^{st} year, 2^{nd} year, 3^{rd} year, and 4^{th} year or greater)? Are there differences in nutrition behaviors between male and female college students?

In order to answer Research Question 1, analyses that examined the preliminary BMI and nutrition behaviors of college students across class years and by gender were performed. First, frequencies, means, and standard deviations were computed to describe baseline BMI measurements and nutrition behaviors (see Tables 9 and 10). One way ANOVAs were conducted to determine significant differences in preliminary BMI and average meal size consumption of college students across class years and between males and females. A multinomial logistic regression model was performed to examine differences in fruit and vegetable servings consumed per day across class years and between males and females.

Table 9.

Weight and Nutrition Behaviors of the Overall Sample by Gender (n=444).

Characteristics	Overall Sample	Males	Females
		n(%) or μ (*sd*)/*R*	
Fruit and Vegetable Servings Per Day	(*n*=443)	(*n*=188)	(*n*=255)
0 servings	27 (6.1%)	15 (8.0%)	12 (4.7%)
1-2 servings	283 (63.9%)	124 (66%)	159 (62.4%)
3-4 servings	116 (26.2%)	42 (22.3%)	74 (29%)
5 or more servings	17 (3.8%)	7 (3.7%)	10 (3.9%)
Average Meal Size Consumption	(*n*=443)	(*n*=188)	(*n*=255)
	1.88 (0.38)	1.98 (0.42)	1.81 (0.33)
	(1.0-3.0)	(1.0-3.0)	(1.0-3.0)
BMI	(*n*=442)	(*n*=188)	(*n*=254)
	24.20 (5.19)	24.72 (4.72)	23.82 (5.49)
	(6.31-52.86)	(16.82-52.86)	(6.31-51.37)
BMI Categories	(*n*=439)	(*n*=187)	(*n*=252)
1 – Underweight	24 (5.5%)	6 (3.2%)	18 (7.1%)
2 – Normal Weight	257 (58.5%)	100 (53.5%)	157 (62.3%)
3 – Overweight	111 (25.3%)	62 (33.2%)	49 (19.4%)
4 – Obese I	33 (7.5%)	15 (8.0%)	18 (7.1%)
5 – Obese II	6 (1.4%)	2 (1.1%)	4 (1.6%)
6 – Obese III	8 (1.8%)	2 (1.1%)	6 (2.4%)

Notes. Sample sizes vary due to missing data; *n=sample size;* % =sample percent; μ*=mean; sd*=standard deviation; *R*=range; Average Meal Size Consumption = The average meal size consumption for breakfast, lunch and dinner. Selections were: Skipped or did not eat=0, Light=1, Moderate=2, Large=3; BMI = body mass index; BMI Categories 1=BMI<=18.49, 2=18.5<BMI<24.9, 3=25<BMI<29.9, 4=30<BMI<34.9, 5=35<BMI<39.9, 6=BMI>=40

Table 10.

Weight and Nutrition Behaviors of the Sample across Class Years (n=444).

Characteristics	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (*sd*)/*R*		
Fruit and Vegetable Servings Per Day	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
0 servings	2 (6.5%)	16 (6.6%)	6 (5.7%)	3 (4.8%)
1-2 servings	18 (58.1%)	152 (62.3%)	68 (64.2%)	45 (72.6%)
3-4 servings	11 (35.5%)	68(27.9%)	27 (25.5%)	10 (16.1%)
5 or more servings	-	8 (3.3%)	5 (4.7%)	4 (6.5%)

(Continued)

Characteristics	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (sd)/R		
Average Meal Size Consumption	(n=31) 1.89 (0.41) (1.33-3.0)	(n=244) 1.89 (0.40) (1.0-3.0)	(n=106) 1.85 (0.38) (1.0-2.67)	(n=62) 1.89 (0.32) (1.33-3.0)
BMI	(n=31) 23.15 (3.98) (16.82-33.65)	(n=244) 24.23 (5.44) (6.31-51.37)	(n=107) 24.11 (4.75) (16.74-40.38)	(n=62) 24.78 (5.46) (16.56-52.86)
BMI Categories	(n=31)	(n=240)	(n=106)	(n=62)
1 – Underweight	3 (9.7%)	11 (4.6%)	7 (6.6%)	3 (4.8%)
2 – Normal Weight	20 (64.5%)	143 (59.6%)	60 (56.6%)	3 (54.8%)
3 – Overweight	5 (16.1%)	60 (25%)	27 (25.5%)	19 (30.6%)
4 – Obese I	3 (9.7%)	17 (7.1%)	9 (8.5%)	4 (6.5%)
5 – Obese II	-	3 (1.3%)	2 (1.9%)	1 (1.6%)
6 – Obese III	-	6 (2.5%)	1 (0.9%)	1 (1.6%)

Notes. Sample sizes vary due to missing data; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; n=sample size; % =sample percent; μ=mean; sd=standard deviation; R=range; Average Meal Size Consumption = The average meal size consumption for breakfast, lunch and dinner. Selections were: Skipped or did not eat=0, Light=1, Moderate=2, Large=3; BMI = body mass index; BMI Categories 1=BMI<=18.49, 2=18.5<BMI<24.9, 3=25<BMI<29.9, 4=30<BMI<34.9, 5=35<BMI<39.9, 6=BMI>=40

One Way ANOVA: Baseline BMI Differences across Class Years and by Gender

One way ANOVAs indicated that there was not a significant difference in the baseline BMI across class years (F=0.669; df=3; p=0.571), however, there was a difference that approached significance in the baseline BMI measurements (F=3.313; df=1; p=0.069) between males (μ=24.68; sd=4.50) and females (μ=23.83; sd=5.12; see Tables 11-13). Sample characteristics were previously reported to describe baseline BMI measurements (see Tables 9 and 10).

Table 11.

One Way ANOVA Source Table: Baseline BMI Differences across Class Years.

Source	SS	*df*	MS	*F*
Class	47.89	3	15.963	0.669
Error	10450.911	438	23.861	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 12.

One Way ANOVA Source Table: Baseline BMI Differences by Gender.

Source	SS	*df*	MS	*F*
Gender	78.458	1	78.458	3.313
Error	10420.343	440	23.683	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 13.

One Way ANOVA Effect Size: Baseline BMI Differences by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	24.6785	4.49908	188	4.866477848	0.18
Female	23.8263	5.12112	254		

Notes. μ=mean; *sd*=standard deviation; *n*=sample size

One Way ANOVA: Average Meal Size Consumption across Class Years and by Gender

One way ANOVAs indicated that there was not a significant difference in average meal size consumption across the class years (F=0.259; df=3; p=0.855), however, there was a significant difference in the average meal size consumption (F=24.646; df=1; p=0.00) between males (μ=1.98; sd=0.42) and females (μ=1.81; sd=0.34; see Tables 14-

16). Sample characteristics were previously reported to describe average meal size consumption (see Tables 9 and 10).

Table 14.

One Way ANOVA Source Table: Average Meal Size Consumption across Class Years.

Source	SS	*df*	MS	*F*
Class	0.114	3	0.038	0.855
Error	64.612	439	0.147	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 15.

One Way ANOVA Source Table: Average Meal Size Consumption by Gender.

Source	SS	*df*	MS	*F*
Gender	3.426	1	3.426	24.646
Error	61.301	441	0.139	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 16.

One Way ANOVA Effect Size: Average Meal Size Consumption by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	1.9832	0.41637	188	0.372834798	0.48
Female	1.8052	0.33721	255		

Notes. *μ*=mean; *sd*=standard deviation; *n*=sample size

Logistic Regression: Fruit and Vegetable Servings per Day across Class Years and by Gender

A multinomial logistic regression model indicated that there was not a significant difference in fruit and vegetable servings per day between class years (p=0.442) or

between males and females (p=0.264; see Tables 17 and 18). For this analysis, consumption of fruit and vegetable servings per day was treated as a categorical variable and used as the dependent variable. Sample characteristics were reported to describe baseline fruit and vegetable servings per day (see Tables 9 and 10).

Table 17.

Logistic Regression Model for Fruit and Vegetable Servings per Day across Class Years.

Fruit and Vegetable Servings per Day	β	SE	Wald	*df*	*p value*
0 servings					
Class 1	17.850	1.012	311.092	1	0.000
Class 2	0.981	0.878	1.248	1	0.264
Class 3	0.470	0.975	0.233	1	0.630
Class 4	0[b]	-	-	0	-
1-2 servings					
Class 1	17.339	0.518	1118.988	1	0.000
Class 2	0.524	0.635	0.680	1	0.410
Class 3	0.190	0.698	0.074	1	0.786
Class 4	0[b]	-	-	0	-
3-4 servings					
Class 1	18.351	0.000	-	1	-
Class 2	1.224	0.700	3.058	1	0.080
Class 3	0.770	0.766	1.010	1	0.315
Class 4	0[b]	-	-	0	-

Notes. Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; β=standardized beta weight; SE=standard error; Wald=Wald statistic; *df* =degrees of freedom; 0[b]=The parameter was set to 0 because is was redundant

Table 18.

Logistic Regression Model for Fruit and Vegetable Servings per Day by Gender.

Fruit and Vegetable Servings per Day	β	SE	Wald	*df*	*p value*
0 servings					
Males	0.580	0.627	0.856	1	0.355
Females	0[b]	-	-	0	-
1-2 servings					
Males	0.108	0.507	0.045	1	0.831
Females	0[b]	-	-	0	-

(Continued)

Fruit and Vegetable Servings per Day	β	SE	Wald	*df*	*p value*
3-4 servings					
Males	-0.210	0.529	0.157	1	0.692
Females	0[b]	-	-	0	-

Notes. β=standardized beta weight; SE=standard error; Wald=Wald statistic; *df* =degrees of freedom; 0[b] = The parameter was set to 0 because is was redundant

Research Question 2

Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?

The total sample size to complete both height and weight measurements was 365 (see Tables 19 and 20 for sample demographics). In order to answer Research Question 2, analyses that examined BMI change (BMI time 2 – BMI time 1; [BMI 2 – BMI 1]) of college students across class years and by gender were performed for descriptive purposes. Frequencies, means, and standard deviations were computed to describe BMI measurements for the baseline and second height and weight measurements, using BMI as a continuous variable and reporting descriptive statistics for BMI categories at both time points (see Tables 21 and 22).

Table 19.

Demographic Characteristics of the Overall Matched Sample of College Students and by Gender (n=365).*

Characteristic	Overall Sample *n*(%) or μ (*sd*)	Males *n*(%) or μ (*sd*)	Females *n*(%) or μ (*sd*)
Gender	(*n*=365)		
Male	157 (43%)	157 (43%)	-
Female	208 (57%)	-	208 (57%)

(Continued)

Characteristic	Overall Sample	Males	Females
	n(%) or μ (*sd*)	*n*(%) or μ (*sd*)	
Ethnicity	(*n*=364)	(*n*=157)	(*n*=207)
White	241 (66.2%)	105 (66.9%)	136 (65.7%)
Black	29 (8.0%)	10 (6.4%)	19 (9.2%)
Hispanic/Latino	46 (12.6%)	22 (14%)	24 (11.6%)
Asian/Pacific Islander	35 (2.2%)	16 (10.2%)	19 (9.2%)
Other	13 (3.6%)	4 (2.6%)	9 (4.3%)
Age	(*n*=365)	(*n*=157)	(*n*=208)
	19.88 (2.61)	20.22 (2.89)	19.62 (2.34)
Year in School	(*n*=365)	(*n*=157)	(*n*=208)
First Year	26 (7.1%)	8 (5.1%)	18 (8.7%)
Second Year	204 (55.9%)	87 (55.4%)	117 (56.3%)
Third Year	89 (24.4%)	40 (25.5%)	49 (23.6%)
Fourth/Fifth Year	46 (12.6%)	22 (14.0%)	24 (11.5%)
Enrollment Status	(*n*=353)	(*n*=151)	(*n*=202)
Full-time	353 (100%)	151 (100%)	202 (100%)
GPA	(*n*=325)	(*n*=130)	(*n*=195)
A	112 (34.5%)	35 (26.9%)	77 (39.5%)
B	173 (53.2%)	75 (57.7%)	98 (50.3%)
C	37 (11.4%)	18 (13.8%)	19 (9.7%)
D/F	3 (0.9%)	2 (1.5%)	1 (0.5%)
Greek Affiliation	(*n*=354)	(*n*=151)	(*n*=203)
Yes	88 (24.9%)	29 (19.2%)	59 (29.1%)
No	266 (75.1%)	122 (80.8%)	144 (70.9%)
Residence	(*n*=365)	(*n*=157)	(*n*=208)
Campus Residence Hall	61 (16.7%)	15 (9.6%)	46 (22.1%)
Other College/University Housing	16 (4.4%)	8 (5.1%)	8 (3.8%)
Parent/Guardian's Home	7 (1.9%)	1 (0.6%)	6 (2.9%)
Apartment Complex	199 (54.5%)	92 (58.6%)	107 (51.4%)
Rental House within a Neighborhood	60 (16.4%)	27 (17.2%)	33 (15.9%)
Other Off-Campus Housing	22 (6.0%)	14 (8.9%)	8 (3.8%)
Relationship Status	(*n*=365)	(*n*=157)	(*n*=208)
Yes	122 (33.4%)	52 (33.1%)	70 (33.6%)
No	243 (66.6%)	105 (66.9%)	138 (66.3%)
Employment – Work for Pay	(*n*=365)	(*n*=157)	(*n*=208)
Yes	113 (31%)	48 (30.6%)	65 (31.4%)
No	252 (69%)	109 (69.4%)	143 (68.8%)
Moderate Physical Activity	(*n*=268)	(*n*=124)	(*n*=144)
Minutes Per Week	408.6 (467.54)	420.98 (380.2)	397.95 (532.51)

(Continued)

Characteristic	Overall Sample *n*(%) or μ (*sd*)	Males *n*(%) or μ (*sd*)	Females
Vigorous Physical Activity Minutes Per Week	(*n*=266) 282.77 (730.21)	(*n*=115) 348.48 (394.23)	(*n*=151) 232.74 (904.46)
Alcohol Use**	(*n*=360)	(*n*=155)	(*n*=205)
Yes	169 (47%)	92 (59.3%)	77 (37.6%)
No	191 (53.1%)	63 (40.7%)	128 (62.5%)
Tobacco Use**	(*n*=363)	(*n*=156)	(*n*=207)
Yes	40 (11%)	36 (23.1%)	4 (2.0%)
No	323 (89%)	120 (77%)	203 (98.1%)

Notes. Sample sizes vary due to missing data; **n=365* participants who completed both height and weight measurements; *n*=sample size*;* % =sample percent; μ=mean*; sd*=standard deviation; Ethnicity Other = American Indian, Alaskan Native, or Native American, Biracial or multiracial, and Other; GPA = Grade Point Average; **Alcohol and Tobacco Use is based on the last 30 days

Table 20.

Demographic Characteristics of the Matched Sample of College Students across Class Years (n=365).*

Characteristic	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (*sd*)		
Year in School (*n*=365)				
First Year	26 (7.1%)	-	-	-
Second Year	-	204 (55.9%)	-	-
Third Year	-	-	89 (24.4%)	-
Fourth/Fifth Year	-	-	-	46 (12.6%)
Gender (*n*=365)	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
Male	8 (30.8%)	87 (42.6%)	40 (44.9%)	22 (47.8%)
Female	18 (69.2%)	117 (57.4%)	49 (55.1%)	24 (52.2%)
Ethnicity (*n*=364)	(*n*=26)	(*n*=203)	(*n*=89)	(*n*=46)
White	22 (84.6%)	146 (71.9%)	41 (46.1%)	32 (69.6%)
Black	-	9 (4.4%)	18 (20.2%)	2 (4.3%)
Hispanic/Latino	1 (3.8%)	25 (12.3%)	13 (14.6%)	7 (15.2%)
Asian/Pacific Islander	3 (11.5%)	14 (6.9%)	13 (14.6%)	5 (10.9%)
Other	-	9 (4.5%)	4 (4.4%)	-
Age (*n*=365)	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
	18.54 (1.58)	19.14 (0.64)	20.65 (3.35)	22.39 (4.32)
Enrollment Status (*n*=353)	(*n*=26)	(*n*=196)	(*n*=87)	(*n*=44)
Full-time	26 (100%)	196 (100%)	87 (100%)	44 (100%)
GPA (*n*=325)	(*n*=24)	(*n*=183)	(*n*=80)	(*n*=38)
A	17 (70.8%)	64 (35%)	25 (31.3%)	6 (15.8%)
B	7 (29.2%)	98 (53.6%)	44 (55%)	24 (63.2%)
C	-	19 (10.4%)	11 (13.8%)	7 (18.4%)
D/F	-	2 (1.1%)	-	1 (2.6%)

(Continued)

Characteristic	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (*sd*)		
Greek Affiliation (*n*=354)	(*n*=26)	(*n*=198)	(*n*=85)	(*n*=45)
Yes	-	54 (27.3%)	22 (25.9%)	12 (26.7%)
No	26 (100%)	144 (72.7%)	63 (74.1%)	33 (73.3%)
Residence (*n*=365)	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
Campus Residence Hall	25 (96.2%)	23 (11.3%)	11 (12.4%)	2 (4.3%)
Other College/University Housing	-	8 (3.9%)	6 (6.7%)	2 (4.3%)
Parent/Guardian's Home	-	3 (1.5%)	2 (2.2%)	2 (4.3%)
Apartment Complex	-	129 (63.2%)	46 (51.7%)	24 (52.2%)
Rental House within a Neighborhood	1 (3.8%)	32 (15.7%)	20 (22.5%)	7 (15.2%)
Other Off-Campus Housing	-	9 (4.4%)	4 (4.5%)	9 (19.6%)
Relationship Status (*n*=365)	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
Yes	11 (42.3%)	58 (28.4%)	31 (34.8%)	22 (47.8%)
No	15 (57.7%)	146 (71.6%)	58 (65.2%)	24 (52.2%)
Employment - Work for Pay (*n*=365)	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
Yes	2 (7.7%)	53 (26%)	38 (42.8%)	20 (43.4%)
No	24 (92.3%)	151 (74%)	51 (57.3%)	26 (56.5%)
Moderate Physical Activity (*n*=268)	(*n*=20)	(*n*=146)	(*n*=63)	(*n*=39)
Minutes Per Week	364 (249.56)	375.14 (356.45)	438.17 (499.23)	508.97 (772.14)
Vigorous Physical Activity (*n*=266)	(*n*=19)	(*n*=141)	(*n*=67)	(*n*=39)
Minutes Per Week	205.26 (235.64)	232.22 (302.22)	275.75 (428.31)	515.38 (1723.04)
Alcohol Use** (*n*=360)	(*n*=26)	(*n*=201)	(*n*=87)	(*n*=46)
Yes	2 (7.6%)	96 (47.7%)	36 (41.2%)	35 (76.2%)
No	24 (92.3%)	105 (52.2%)	51 (58.6%)	11 (23.9%)
Tobacco Use** (*n*=363)	(*n*=26)	(*n*=203)	(*n*=89)	(*n*=45)
Yes	1 (3.8%)	24 (12%)	8 (8.8%)	7 (15.4%)
No	25 (96.1%)	179 (88.2%)	81 (90.9%)	38 (84.5%)

Notes. Sample sizes vary due to missing data; ***n=365* participants who completed both height and weight measurements; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size*;* % =sample percent; μ=mean*; sd*=standard deviation; Ethnicity Other = American Indian, Alaskan Native, or Native American, Biracial or multiracial, and Other; GPA = Grade Point Average; **Alcohol and Tobacco Use is based on the last 30 day

Table 21.

BMI and BMI Change of a Sample of College Students by Gender (n=365).*

Characteristics	Overall Sample	Males	Females
		n(%) or μ (*sd*)/*R*	
BMI Time 1	(*n*=365)	(*n*=157)	(*n*=208)
	24.07 (5.05)	24.73 (4.89)	23.56 (5.11)
	(6.31-52.86)	(16.82-52.86)	(6.31-50.78)
BMI Time 1 Categories	(*n*=362)	(*n*=156)	(*n*=206)
1 – Underweight	20 (5.5%)	5 (3.2%)	15 (7.3%)
2 – Normal Weight	214 (59.1%)	84 (53.8%)	130 (63.1%)
3 – Overweight	91 (25.1%)	51 (32.7%)	40 (19.4%)
4 – Obese I	27 (7.5%)	12 (7.7%)	15 (7.3%)
5 – Obese II	5 (1.4%)	2 (1.3%)	3 (1.5%)
6 – Obese III	5 (1.4%)	2 (1.3%)	3 (1.5%)
BMI Time 2	(*n*=365)	(*n*=157)	(*n*=208)
	24.15 (4.96)	24.95 (4.79)	23.55 (5.01)
	(14.66-50.84)	(18.08-50.84)	(14.66-47.11)
BMI Time 2 Categories	(*n*=360)	(*n*=154)	(*n*=206)
1 – Underweight	14 (3.9%)	1 (0.6%)	13 (6.3%)
2 – Normal Weight	222 (61.7%)	86 (55.8%)	136 (66%)
3 – Overweight	89 (24.7%)	49 (31.8%)	40 (19.4%)
4 – Obese I	23 (6.4%)	12 (7.8%)	11 (5.3%)
5 – Obese II	5 (1.4%)	3 (1.9%)	2 (1.0%)
6 – Obese III	7 (1.9%)	3 (1.9%)	4 (1.9%)
BMI Change	(*n*=365)	(*n*=157)	(*n*=208)
	0.09 (1.64)	0.22 (1.25)	-0.01 (1.87)
	(-13.70-16.19)	(-3.11-7.44)	(-13.70-16.19)

Notes. ***n=365*** participants who completed both height and weight measurements; *n*=sample size*;* % =sample percent; μ=mean*; sd*=standard deviation; *R*=range; BMI = body mass index; BMI Categories 1=BMI<=18.49, 2=18.5<BMI<24.9, 3=25<BMI<29.9, 4=30<BMI<34.9, 5=35<BMI<39.9, 6=BMI>=40; BMI Change = BMI Time 2 – BMI Time 1

Table 22.

BMI and BMI Change of a Sample of College Students across Class Years (n=365).*

Characteristics	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (sd)/*R*		
BMI Time 1	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
	23.13 (4.22)	23.94 (4.99)	24.23 (4.83)	24.84 (6.05)
	(16.82-33.65)	(6.31-50.78)	(16.74-40.38)	(16.56-52.86)

(Continued)

Characteristics	Class 1	Class 2	Class 3	Class 4
		n(%) or μ (sd)/*R*		
BMI Time 1 Categories	(*n*=26)	(*n*=202)	(*n*=88)	(*n*=46)
1 – Underweight	3 (11.5%)	9 (4.5%)	5 (5.7%)	3 (6.5%)
2 – Normal Weight	16 (61.5%)	124 (61.4%)	51 (58%)	23 (50%)
3 – Overweight	4 (15.4%)	50 (24.8%)	22 (25%)	15 (32.6%)
4 – Obese I	3 (11.5%)	14 (6.9%)	7 (8.0%)	3 (6.5%)
5 – Obese II	-	2 (1.0%)	2 (2.3%)	1 (2.2%)
6 – Obese III	-	3 (1.5%)	1 (1.1%)	1 (2.2%)
BMI Time 2	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
	23.66 (3.87)	23.99 (4.7)	24.4 (5.39)	24.69 (5.78)
	(18.08-32.73)	(14.66-46.76)	(16.91-47.11)	(16.48-50.84)
BMI Time 2 Categories	(*n*=26)	(*n*=202)	(*n*=87)	(*n*=45)
1 – Underweight	1 (3.8%)	8 (4.0%)	3 (3.4%)	2 (4.4%)
2 – Normal Weight	18 (69.2%)	126 (62.4%)	53 (60.9%)	25 (55.6%)
3 – Overweight	4 (15.4%)	51 (25.2%)	21 (24.1%)	13 (28.9%)
4 – Obese I	3 (11.5%)	11 (5.4%)	6 (6.9%)	3 (6.7%)
5 – Obese II	-	3 (1.5%)	2 (2.3%)	-
6 – Obese III	-	3 (1.5%)	2 (2.3%)	2 (4.4%)
BMI Change	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
	0.53 (1.3)	0.05 (1.89)	0.16 (1.34)	-0.15 (0.97)
	(-0.92-6.06)	(-13.70-16.19)	(-6.36-6.73)	(-4.69-1.24)

Notes. ***n=365*** participants who completed both height and weight measurements; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size*;* % =sample percent; μ=mean*; sd*=standard deviation; *R*=range; BMI = body mass index; BMI Categories 1=BMI<=18.49, 2=18.5<BMI<24.9, 3=25<BMI<29.9, 4=30<BMI<34.9, 5=35<BMI<39.9, 6=BMI>=40

Repeated Measures ANOVA: BMI Change

A repeated measures ANOVA was then conducted to examine differences in BMI from time 1 to time 2 (within group differences) between class and males and females (between group differences; please see Tables 23-25). The results from the repeated measures ANOVA indicated that there was not a significant difference in BMI from time 1 to time 2 overall for college students between class years (p=0.224). However, differences in BMI from time 1 to time 2 approached significance between males and females (p=0.081), where males increased their BMI more than females from time 1 (μ=24.68) to time 2 (μ=24.92). Although not significant, females showed to decrease

their BMI from time 1 (μ=23.6) to time 2 (μ=23.55). Tests of between-subjects effects were also performed to examine differences in BMI change across class year and gender after collapsing BMI 1 and BMI 2 as a weighted mean. These calculations indicated that there was not a significant difference (F=0.33; df=1; p=0.804) in BMI change across class years (see Table 23). The test also indicated that there was a significant difference (F=5.759; df=1; p=0.017) in BMI change between males and females (see Table 24).

Table 23.

Repeated Measures ANOVA Examining BMI Time 1 and BMI Time 2 across Class Years (n=365).*

Characteristics	Class 1	Class 2	Class 3	Class 4
			μ (*sd*)/*R*	
BMI Time 1**	(*n*=26)	(*n*=204)	(*n*=89)	(*n*=46)
	23.13 (4.22)	23.98 (4.64)	24.23 (4.83)	24.67 (5.3)
	(16.82-33.65)	(16.43-44.97)	(16.74-40.38)	(16.56-44.97)
BMI Time 2***	23.66 (3.87)	23.98 (4.69)	24.39 (5.37)	24.6 (5.38)
	(18.08-32.73)	(14.66-46.59)	(16.91-46.59)	(16.48-46.59)

Notes. **n=365* participants who completed both height and weight measurements; **windzorized 99th (44.9688); ***windzorized 99th (46.5938); Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; *R*=range; BMI = body mass index

Table 24.

Repeated Measures ANOVA Examining BMI Time 1 and BMI Time 2 by Gender (n=365).*

Characteristics	Overall Sample	Males	Females
		μ (*sd*)/*R*	
BMI Time 1**	(*n*=365)	(*n*=157)	(*n*=208)
	24.07 (4.75)	24.68 (4.63)	23.6 (4.79)
	(16.43-44.97)	(16.82-44.97)	(16.43-44.97)
BMI Time 2***	24.14 (4.89)	24.92 (4.66)	23.55 (4.99)
	(14.66-46.59)	(18.08-46.59)	(14.66-46.59)

Notes. **n=365* participants who completed both height and weight measurements; **windzorized 99th (44.9688); ***windzorized 99th (46.5938); *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; *R*=range; BMI = body mass index

Table 25.

Tests of Between-Subjects Source Table: BMI Time 1 and BMI Time 2 across Class Years and by Gender.

Source	Type III SS	*df*	MS	*F*
Intercept	225302.335	1	225302.335	4985.301
Gender	260.26	1	260.26	5.759
Class	44.732	3	14.911	0.33
Gender*Class	107.272	3	35.757	0.791
Error	16134.018	357	45.193	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Research Question 3

What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

In order to answer Research Question 3, analyses that examined perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students and if there were differences across class years and by gender were conducted. First, frequencies, means, and standard deviations were computed to describe the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students (see Tables 26 and 27). One way ANOVAs were then conducted to determine if there were differences in perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students across class year and by gender. Non-parametric tests were used for variables without normal

distribution: the total number of meals a student prepared per week, the total number of meals a student ate a restaurant per week, and the total number of meals a student ate at a dining hall per week.

Table 26.

Perceived Social and Physical Environment Factors and Associated Self-Efficacy Levels of a Sample of College Students by Gender (n=444).

Characteristics	Overall Sample	Males	Females
		μ (*sd*)/*R*	
Number of People at Breakfast*	(*n*=442)	(*n*=188)	(*n*=254)
	0.69 (1.21)	0.74 (1.41)	0.65 (1.03)
	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)
Number of People at Lunch*	(*n*=442)	(*n*=188)	(*n*=254)
	2.24 (1.74)	2.43 (1.94)	2.11 (1.57)
	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)
Number of People at Dinner*	(*n*=443)	(*n*=188)	(*n*=255)
	2.76 (1.75)	2.74 (1.82)	2.78 (1.71)
	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)
Average Number of People at Meals*	(*n*=443)	(*n*=188)	(*n*=255)
	1.9 (1.2)	1.97 (1.33)	1.84 (1.09)
	(0.0-7.33)	(0.0-7.33)	(0.0-5.33)
Meals Prepared **	(*n*=443)	(*n*=188)	(*n*=255)
	8.28 (5.67)	7.49 (5.57)	8.87 (5.68)
	(0.0-21)	(0.0-21)	(0.0-21)
Meals Ate at a Restaurant**	(*n*=443)	(*n*=188)	(*n*=255)
	3.66 (2.99)	3.98 (3.4)	3.43 (2.63)
	(0.0-20)	(0.0-20)	(0.0-14)
Meals Ate at a Dining Hall**	(*n*=443)	(*n*=188)	(*n*=255)
	6.31 (5.98)	6.84 (6.26)	5.93 (5.74)
	(0.0-21)	(0.0-21)	(0.0-21)
Barriers – Availability	(*n*=442)	(*n*=189)	(*n*=253)
	7.84 (2.09)	7.71 (2.04)	7.93 (2.13)
	(3.0-12)	(3.0-12)	(3.0-12)
SE – Availability	(*n*=444)	(*n*=189)	(*n*=255)
	24.61 (9.34)	25.78 (9.68)	23.74 (9.0)
	(0.0-40)	(0.0-40)	(0.0-40)

(Continued)

Characteristics	Overall Sample	Males	Females
		μ (*sd*)/*R*	
SE – Social Pressures	(*n*=444)	(*n*=189)	(*n*=255)
	26.37 (8.59)	27.28 (8.86)	25.69 (8.33)
	(2.0-40)	(4.0-40)	(2.0-40)

Notes. Sample sizes vary due to missing data; *Number of people with whom the participants ate their meals; **Location of meals per week; SE = self-efficacy; *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; *R*=range

Table 27.

Perceived Social and Physical Environment Factors and Associated Self-Efficacy Levels of a Sample of College Students across Class Years (n=444).

Characteristics	Class 1	Class 2	Class 3	Class 4
		μ (*sd*)/*R*		
Number of People at Breakfast*	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=61)
	0.97 (1.08)	0.79 (1.22)	0.44 (1.0)	0.56 (1.48)
	(0.0-3.0)	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)
Number of People at Lunch*	(*n*=31)	(*n*=243)	(*n*=106)	(*n*=62)
	2.94 (2.16)	2.44 (1.68)	1.93 (1.66)	1.68 (1.68)
	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)	(0.0-8.0)
Number of People at Dinner*	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
	3.3 (1.47)	3.07 (1.85)	2.38 (1.57)	1.97 (1.39)
	(0.0-6.0)	(0.0-8.0)	(0.0-8.0)	(0.0-6.0)
Average Number of People at Meals*	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
	2.4 (0.91)	2.1 (1.26)	1.58 (1.05)	1.41 (1.04)
	(1.0-5.0)	(0.0-7.33)	(0.0-5.67)	(0.0-5.33)
Meals Prepared **	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
	7.78 (5.37)	6.45 (5.4)	10.4 (5.36)	12.13 (4.11)
	(0.0-19)	(0.0-21)	(0.0-21)	(0.0-21)
Meals Ate at a Restaurant**	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
	3.03 (2.93)	3.51 (2.88)	3.78 (3.27)	4.37 (2.9)
	(0.0-12)	(0.0-20)	(0.0-19)	(0.0-12)
Meals Ate at a Dining Hall**	(*n*=31)	(*n*=244)	(*n*=106)	(*n*=62)
	6.9 (6.01)	8.59 (6.0)	3.81 (4.5)	1.34 (2.45)
	(0.0-21)	(0.0-21)	(0.0-18)	(0.0-13)
Barriers – Availability	(*n*=31)	(*n*=243)	(*n*=106)	(*n*=62)
	7.48 (1.77)	7.99 (2.16)	7.58 (2.07)	7.85 (1.97)
	(4.0-11)	(3.0-12)	(3.0-12)	(4.0-12)

(Continued)

Characteristics	Class 1	Class 2	Class 3	Class 4
		μ (*sd*)/*R*		
SE – Availability	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
	27.48 (8.51)	24.67 (9.35)	23.16 (9.82)	25.4 (8.56)
	(12-40)	(0.0-40)	(0.0-40)	(5.0-40)
SE – Social Pressures	(*n*=31)	(*n*=244)	(*n*=107)	(*n*=62)
	28.06 (8.27)	26.17 (8.82)	26.57 (7.93)	25.95 (8.98)
	(13-40)	(3.0-40)	(8.0-40)	(2.0-40)

Notes. Sample sizes vary due to missing data; *Number of people with whom the participants ate their meals; **Location of meals per week; SE = self-efficacy; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size; % =sample percent; μ=mean; *sd*=standard deviation; *R*=range

One Way ANOVAs: Average Number of People with whom Students Ate Meals with Per Week across Class Years and by Gender

One way ANOVAs indicated that there was a significant difference in the average number of people with whom the students ate meals across the class years (F=10.559; df=3; p=0.000; see Figure 2; Table 28), however, there was not a significant difference between males and females (F=1.271; df=1; p=0.26; see Tables 29 and 30). Bonferroni Post Hoc tests showed significant differences in the average number of people with whom the students ate meals between some of the class years. The average number of people with whom the students ate meals (F=10.559; df=3; p=0.000) was significantly different between first year undergraduate students and third (p=0.004) and fourth/fifth year students (p=0.001). First year undergraduate students reported eating with more people (μ=2.40; sd=0.91) than the third (μ=1.58; sd=1.05) and fourth/fifth year undergraduate students (μ=1.41; sd=1.04). There were also significant differences between second year students and third (p=0.001) and fourth/fifth year undergraduate students (p=0.000). Second year undergraduate students reported eating with significantly more people (μ=2.10; sd=1.26) than third (μ=1.58; sd=1.05) and fourth/fifth year undergraduate students (μ=1.41; sd=1.04). The average number of people with

whom the students ate meals was not significantly different between the first and second year undergraduate students (p=1.00) or between the third and fourth/fifth year undergraduate students (p=1.00).

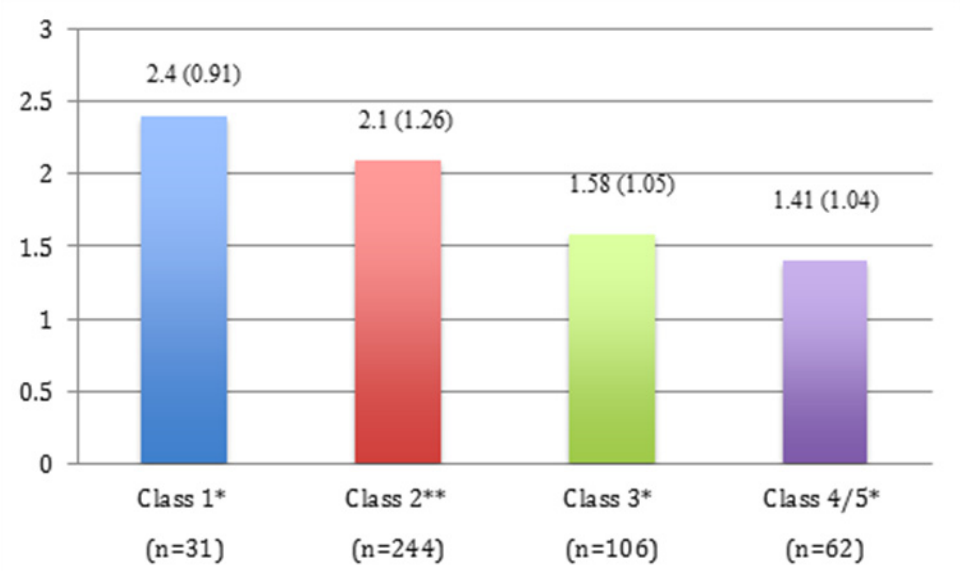

Figure 2. Average Number of People with whom Students Ate Meals with Per Week across Class Years. *Notes*. *Class 1 was significantly different from Class 3 and Class 4/5; **Class 2 was significantly different from Class 3 and Class 4/5; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; n=sample size; μ=mean; sd=standard deviation

Table 28.

One Way ANOVA Source Table: Average Number of People with whom Students Ate Meals with Per Week across Class Years.

Source	SS	*df*	MS	*F*
Class	42.582	3	14.194	10.559
Error	590.131	439	1.344	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 29.

One Way ANOVA Source Table: Average Number of People with whom Students Ate Meals with Per Week by Gender.

Source	SS	*df*	MS	*F*
Gender	1.818	1	1.818	1.271
Error	630.895	441	1.431	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 30.

One Way ANOVA Effect Size: Average Number of People with whom Students Ate Meals with Per Week by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	1.9734	1.33017	188	1.196081137	0.11
Female	1.8438	1.08684	255		

Notes. *μ*=mean; *sd*=standard deviation; *n*=sample size

Non-Parametric Tests: Differences in Total Number of Meals a Student Prepared per Week across Class Years and by Gender

Sample characteristics for number of meals a student prepared per week by class year and gender were previously reported to describe the total number of meals a student prepared per week (see Tables 26 and 27). Since the data did not follow a normal distribution, differences in number of meals a student prepared per week across class year and by gender were examined using the Kruskal-Wallis Non-Parametric test to examine differences among class years and the Mann-Whitney U Non-Parametric test to examine differences between genders. Based on the Kruskal-Wallis Non-Parametric test, significant differences across class years were apparent (p=0.000; see Figure 3). In

comparing gender, the females were significantly more likely to prepare meals per week (p=0.013; μ=8.87; sd=5.68) than the males (μ=7.49; sd=5.57).

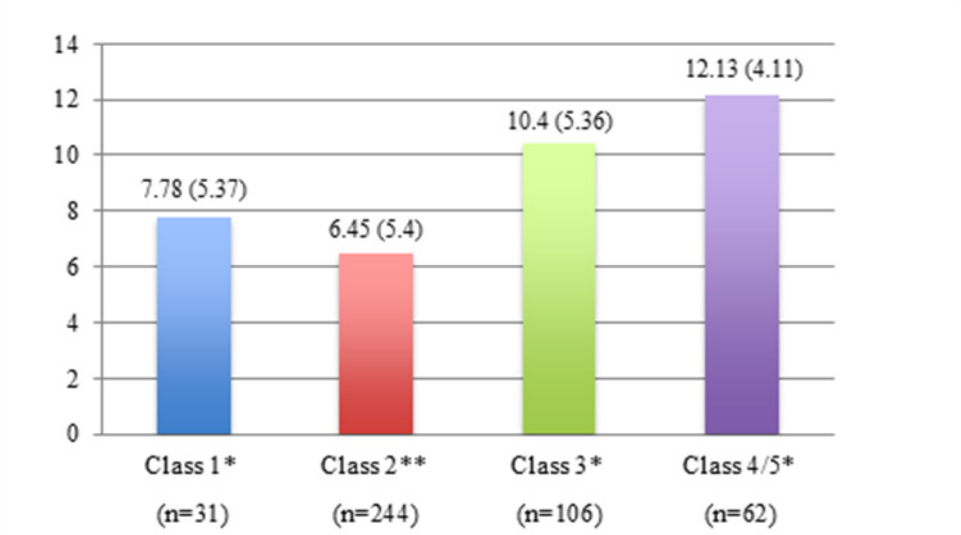

Figure 3. Differences in Total Number of Meals a Student Prepared per Week across Class Years. *Notes*. *Class 1 was significantly different from Class 3 and Class 4/5; **Class 2 was significantly different from Class 3 and Class 4/5; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; n=sample size; μ=mean; sd=standard deviation

Non-Parametric Tests: Differences in Total Number of Meals a Student Ate at a Restaurant per Week across Class Years and by Gender

Sample characteristics for number of meals a student ate at a restaurant per week by class year and gender were previously reported (see Tables 26 and 27). Since the data did not follow a normal distribution, differences in number of meals a student ate at a restaurant per week were examined using the Kruskal-Wallis Non-Parametric test to examine differences among class years and the Mann-Whitney U Non-Parametric test to examine differences between genders. Based on the Kruskal-Wallis Non-Parametric test, significant differences across class years were apparent (p=0.040; see Figure 4). There was not a significant difference between males and females (p=0.173).

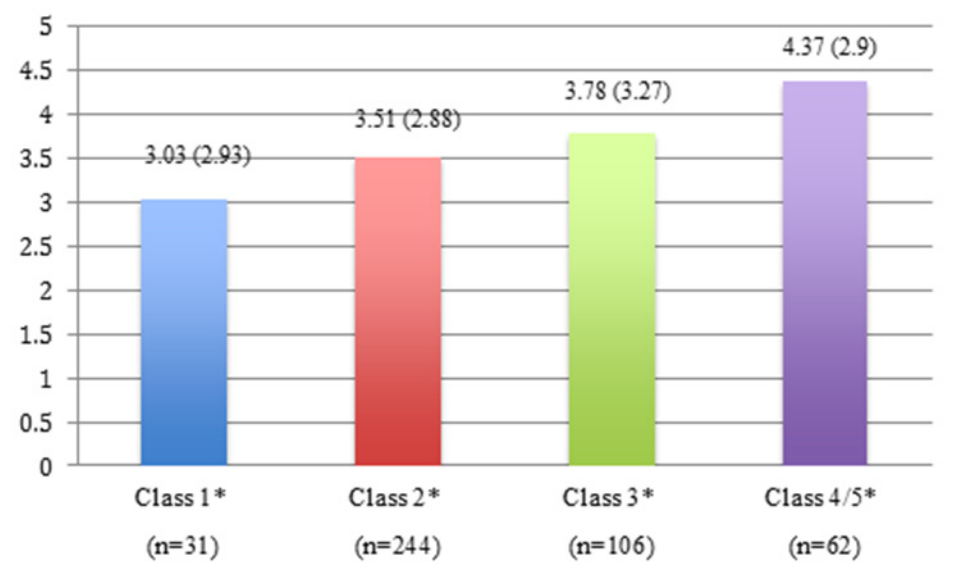

Figure 4. Differences in Total Number of Meals a Student Ate at a Restaurant per Week across Class Years. *Notes*. *There was an increased difference in the number of times a student ate at a restaurant between each class; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size; μ=mean; *sd*=standard deviation

Non-Parametric Tests: Differences in Total Number of Meals a Student Ate at a Dining Hall per Week across Class Years and by Gender

Sample characteristics for number of meals a student ate at a restaurant per week across class years and by gender were previously reported (see Tables 26 and 27). Since the data did not follow a normal distribution, differences in number of meals a student ate at a restaurant per week were examined using the Kruskal-Wallis Non-Parametric test to examine differences among class year and the Mann-Whitney U Non-Parametric test to examine differences between genders. Based on the Kruskal-Wallis Non-Parametric test, significant differences between class years were apparent (p=0.000; see Figure 5). There was not a significant difference between genders (p=0.102).

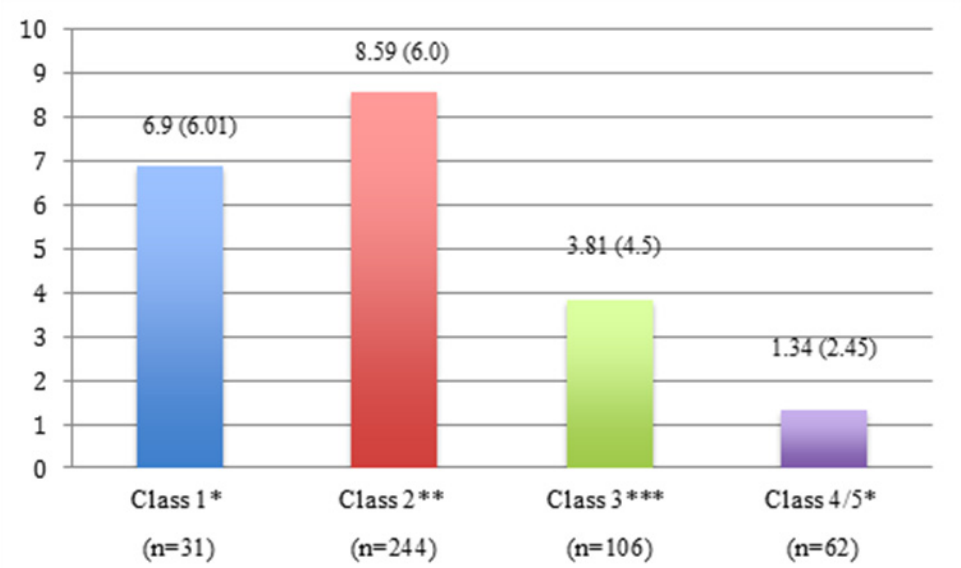

Figure 5. Differences in Total Number of Meals a Student Ate at a Dining Hall per Week across Class Years. *Notes*. *Class 1 was significantly different from Class 3 and Class 4/5; **Class 2 was significantly different from Class 3 and Class 4/5; ***Class 3 was significantly different from Class 4/5; Class 1 = 1st year undergraduate; Class 2 = 2nd year undergraduate; Class 3 = 3rd year undergraduate; Class 4 = 4th/5th year undergraduate; *n*=sample size; μ=mean; *sd*=standard deviation

One Way ANOVA: Availability Barriers across Class Years and by Gender

Sample characteristics were reported previously describing barriers that prevent a student from eating healthy foods (availability) across class years and by gender (see Tables 26 and 27). One way ANOVAs did not support significant differences in barriers that prevent a student from eating healthy foods (availability) among class years (F=1.232; df=3; p=0.298; see Table 31) or between males and females (F=1.139; df=1; p=0.286; see Tables 32 and 33).

Table 31.

One Way ANOVA Source Table: Availability Barriers across Class Years.

Source	SS	*df*	MS	*F*
Class	16.137	3	5.379	1.232
Error	1912.134	438	4.366	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 32.

One Way ANOVA Source Table: Availability Barriers by Gender.

Source	SS	*df*	MS	*F*
Gender	4.981	1	4.981	1.139
Error	1923.291	440	4.371	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 33.

One Way ANOVA Effect Size: Availability Barriers by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	7.71	2.035	189	2.090521288	-0.11
Female	7.93	2.131	253		

Notes. *μ*=mean; *sd*=standard deviation; *n*=sample size

One Way ANOVA: Self-Efficacy - Availability across Class Years and by Gender

Sample characteristics were previously reported describing self-efficacy of students with regards to availability of healthy foods by gender and across class years (see Tables 26 and 27). One way ANOVAs did not support a significant difference in self-efficacy with regards to availability of healthy foods among the class years

(F=2.006; df= 3; p=0.112; see Table 34); however, there was a significant difference between males and females (F=5.231; df=1; p=0.023; see Tables 35 and 36), where males' self-efficacy (μ=25.78; sd=9.68) was greater than that of the females (μ=23.78; sd=9.0).

Table 34.

One Way ANOVA Source Table: Self-Efficacy - Availability across Class Years.

Source	SS	*df*	MS	*F*
Class	521.294	3	173.765	2.006
Error	38120.731	440	86.638	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 35.

One Way ANOVA Source Table: Self-Efficacy - Availability by Gender.

Source	SS	*df*	MS	*F*
Gender	451.962	1	451.962	5.231
Error	38190.063	442	86.403	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 36.

One Way ANOVA Effect Size: Self-Efficacy - Availability by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	25.78	9.681	189	9.295198892	0.22
Female	23.74	8.999	255		

Notes. μ=mean; *sd*=standard deviation; *n*=sample size

One Way ANOVA: Self-Efficacy - Social Pressures across Class Years and by Gender

Sample characteristics were previously reported describing the self-efficacy regarding social pressures to making healthy food choices across class years and by gender (see Tables 26 and 27). One way ANOVAs did not support significant differences in self-efficacy to overcome social pressures to making healthy food choices among class years (F=0.514; df=3; p=0.673; see Table 37). However, the one way ANOVA indicated that the difference between males and females approached significance (F=3.704; df=1; p=0.055; see Tables 38 and 39), where males (μ=27.28; sd=8.89) had higher self-efficacy regarding social pressures to making healthy food choices than females (μ=25.69; sd=8.33).

Table 37.

One Way ANOVA Source Table: Self-Efficacy - Social Pressures across Class Years.

Source	SS	*df*	MS	*F*
Class	114.099	3	38.033	0.514
Error	32537.061	440	73.948	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 38.

One Way ANOVA Source Table: Self-Efficacy - Social Pressures by Gender.

Source	SS	*df*	MS	*F*
Gender	271.326	1	271.326	3.704
Error	32379.834	442	73.258	

Notes. SS=Sum of Squares; *df* =degrees of freedom; MS=Mean Square; *F*=variance of the group means/ mean of the within group variances

Table 39.

One Way ANOVA Effect Size: Self-Efficacy - Social Pressures by Gender.

	μ	*sd*	*n*	Pooled *sd*	Cohen's d
Male	27.28	8.858	189	8.559120367	0.19
Female	25.69	8.331	255		

Notes. μ=mean; *sd*=standard deviation; *n*=sample size

CHAPTER FIVE

Discussion

Introduction

The purpose of the study was to examine the nutrition behaviors and weight change of college students using select SCT constructs. The study was conducted among a sample of college students (*n* =444) from a university in the south central United States through the use of a classroom based self-report assessment instrument. The assessment instrument included items to measure the SCT constructs of environment, situation, and self-efficacy in regards to nutrition behaviors, weight, and weight change. The data was also examined by gender and across class years (1st year, 2nd year, 3rd year, and 4th year or greater) to determine if there were differences in nutrition behaviors, weight, and weight change between males and females and across class years.

The SCT was included in this study because application of the SCT constructs have consistently been effective in establishing behavior change for college students, including weight change and nutrition behaviors. In addition, theoretical factors have been reported as influential in examining health behaviors and behavior change among young adults (Strong et al., 2008). The SCT is an interpersonal theory designed to address an individual's learning of a behavior to determine why or how an individual does or does not participate in a given behavior (McAlister et al., 1996). The SCT posits that an individual's behavior is a product of his/her environment, observation, and social interactions. A number of SCT constructs are consistently related with weight-loss and

management behaviors, including self-efficacy, outcome-expectancy value, self-regulation, and one's perception of his/her social and physical environment, where self-efficacy is viewed as one of the most influential SCT constructs (McAlister et al., 1996). The SCT has been used to examine some aspects of weight gain and nutrition behaviors of college students, yet it has not been used to measure multiple individual and social environmental contributors, and differences between gender and among class year have not been thoroughly examined. Therefore, this study used the SCT to examine SCT factors regarding weight change and nutrition behaviors of college students, and to subsequently examine potential gender differences and differences across class years.

Research Questions

In order to examine weight change and nutrition behavior of college students, the following research questions were examined:

1. What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1st year, 2nd year, 3rd year, and 4th year or greater)? Are there differences in nutrition behaviors between male and female college students?
2. Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?
3. What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Discussion

Research Question 1

What are the preliminary weight and nutrition behaviors of college first-year students at the beginning of the fall semester and are there differences across class years (1st year, 2nd year, 3rd year, and 4th year or greater)? Are there differences in nutrition behaviors between male and female college students?

Research supports that weight gain in the college student population is considerably greater than weight gain in the adult population at large (Levitsky et al., 2004). Previous studies have shown that there were significant differences in the BMI of college students across the class years. Nelson reported that third (22.0%), fourth (23.8%), and fifth (28.7%) year undergraduate students had significantly higher rates of overweight and obesity in comparison to first (18.9%) and second (19.5%) year undergraduate students. However, there was not a significant difference in the weight of first and second year undergraduate students in Nelson's study (2007). In contrast to these previous results, this study did not indicate significant differences in weight across the class years. The lack of a significant difference in the preliminary BMI of college students across class years may be contributed to the unequal distribution of the sample by class; first year undergraduate student (7.0%), second year undergraduate student (55%), third year undergraduate student (24.1%), and fourth/fifth year undergraduate student (14%). The lack of an equal sample size from each class potentially limited the ability to thoroughly test the hypothesis of this research question. Future research should

include a more equally distributed sample size to increase the likelihood that differences between class years would be significant in preliminary BMI.

Although there was not a significant difference in preliminary BMI across the class years, there was a significant difference in preliminary BMI between males and females (F=3.31; df=1; p=0.07). Preliminary BMI of males (μ=24.68; sd=0.07) was higher than preliminary BMI for females (μ=23.83; sd=5.12). The results of this study reflect previous literature that reports differences in BMI for male and female college students, where males were more likely to be overweight or obese than females (LaCaille et al., 2011; Holm-Denoma et al., 2008; Racette et al., 2008). Differences in preliminary BMI between the male and female college students may be contributed to the physiological differences between males and females, including body fat percentage, muscle versus fat ratio, height, build, etc. (Donatelle, 2012). The difference in preliminary BMI between male and female college students may also be contributed to nutrition behaviors that will be discussed later in this section, where males report consuming larger meals. Future research should include assessment items to measure and determine the physiological factors that contribute to weight differences in male and female college students.

Studies have reported a higher incidence in college students adopting unhealthy eating behaviors such as skipping meals, frequent snacking on calorie-dense food, and engaging in unhealthy weight-loss or weight-gain methods (Ha & Caine-Bish, 2009). Adams and Colner (2008) reported that the majority of college students in their study did not meet the daily fruit and vegetable intake recommendations; only 25% of 18-24 year old students consumed five or more servings a day, and higher intake of fruit and

vegetables has been related with lower BMI. Ha and Caine-Bish (2009) reported that there were no significant differences in fruits and vegetable consumption between genders (p=0.13 and p=0.83) or across years in college (p=0.27 and p=0.79). The present study examined the nutrition behaviors of college students and examined if there were significant differences across class years and gender. Nutrition behaviors examined were the average meal size consumption and consumption of fruit and vegetable servings per day. Significant differences did not exist across class years for average meal size and consumption of fruit and vegetable servings per day. Adams and Colner (2008) reported that there are risk behaviors that are associated with fruit and vegetable intake to include seatbelt and helmet use, cigarette smoking alcohol use, sexual activity, etc. Adams and Colner (2008) recommend that future research should include potential risk factors that affect the fruit and vegetable intake of males and females such as the risk behaviors previously stated. The lack of a significant difference across class years could also be due to the participants' lack of clarity as to what constitutes a light, moderate, or large size meal; future studies should better define these items and terms. As previously stated, the lack of a significant difference in the nutrition behaviors of college students across class years may be contributed to the unequal distribution of the sample by class year. Future research should include a more equally distributed sample size to increase the likelihood that differences between class years would be significant in the nutrition behaviors. Future research should include an equally distributed sample size to increase the likelihood of detecting potential significant differences in preliminary BMI across the class years.

This study did support previous studies that have shown that male college students consume more than female college students, but this study did not show that there was a significant difference in the fruit and vegetable consumption between males and females (Strong et al., 2008; Ha & Caine-Bish, 2009; Adams & Colner, 2008). Although Blanchard et al. (2009) did not examine the differences in actual fruit and vegetable consumption between genders, their study did examine and report that female students had significantly higher attitudes, subjective norms, and intentions to eat the recommended five servings of fruits and vegetables a day than male students. Similar to previous studies, the results from this study did not show that there were significant differences in fruit and vegetable servings consumed per day for males and females. There was, however, a significant difference in the average meal size consumption between males and females (F=24.64; df=1; p=0.00). Males tended to eat larger meals (μ =1.98; sd=0.42) in comparison to females (μ=1.81; sd=0.34) in the present study. This result may reflect what has been reported in previous literature, where, the fear of being obese is associated with female students eating habits (McKinley, 2009). This assumption is consistent with findings in previous studies that suggest females are more concerned with body weight and appearance, and thus are more interested in adopting lifestyle changes to maintain weight (Furia et al., 2009; Chung et al., 2006; Brunt & Rhee, 2008). The difference in male and female average meal size consumption may also be associated with the caloric demand differences between males and females (Donatelle, 2012). Future studies should include potential physiological factors, such as body size, composition, metabolism, etc., that may contribute to the nutrition behaviors of males and females so these differences can be better understood. Having a clearer understanding of

the influence that physiological differences between male and female college students have on food consumption will assist researchers, health educators, and other professionals create appropriate interventions and educational strategies. Furthermore, understanding the influence that physiological differences may have on food consumption could help tailor marketing to engage more students in healthy behaviors and lead to the adoption of healthier behaviors of college students.

Research Question 2

Does the weight of college students' change during the fall semester? Are there differences in weight change across class years and between male and female college students?

The BRFSS reported that the greatest increase in obesity rates were among individuals ages 18-29 with at least some college education. Another report from the ACHA revealed that 36.7% of college students were overweight or obese (Wengreen & Moncur, 2009). The rate of weight gain among college students has been reported at 5.5 times higher than the general population (Mihalopoulos et al., 2008). Megel et al. (1994) reported that college students gain an average of 2.5 pounds over a semester, and although college freshmen may not gain the alleged "freshman fifteen," studies have shown that some do gain 3-6 pounds in their first semester of college. And, previous studies have also shown that weight gain occurs for college students (Levtisky et al., 2004; Mihalopoulus et al., 2008; Holm-Denoma et al., 2008; Anderson et al., 2003; Jung et al., 2008; Racette et al., 2005; Racette et al., 2008; Wengreen & Moncur, 2009; Megel et al. 1994). Contrary to these studies, the results from this study did not indicate a

significant difference in weight change across time for the sample, or across the class years (F=0.33; df=3; p=0.804). The lack of a significant difference in the weight change of college students across the class years may potentially be due to the unequal distribution of the sample by class previously described. The lack of an equal sample size from each class potentially limited the ability to thoroughly test the hypothesis of this research question. The small sample (n=31) of first year undergraduate students in this study may have also limited the results to reflect findings from previous studies that reported significant weight change among freshmen students within the first semester and/or year of college (Levtisky et al., 2004; Mihalopoulus et al., 2008; Holm-Denoma et al., 2008; Anderson et al., 2003; Jung et al., 2008; Racette et al., 2005; Racette et al., 2008; Wengreen & Moncur, 2009; Megel et al. 1994; Nelson et al., 2007). Future research should include a more equally distributed sample size to increase the likelihood that potential differences in weight change between class years will be detected. The lack of a significant difference across class years may also be due to the time (six weeks) between BMI measurements. The six weeks between the two BMI measurements may not have been enough time to detect significant weight change among the college students.

Previous studies have concluded that there is weight gain for both male and female college students while in college (LaCaille et al., 2011; Holm-Denoma et al., 2008; Racette et al., 2008). Racette et al. (2008) reported that females gained an average of 3.75 pounds (0.9 pounds per year) and males gained an average of 9.26 pounds (2.3 pounds per year) from freshman to senior in college. Results of the present study indicated that differences in weight change for males and females approached

significance (F=5.759; df=1; p=0.017); however, this study only looked at differences across six weeks. During this time though, male students increased their BMI where, although not significantly different, females decreased BMI. The significant differences in the average meal size consumption between males and females as reported in the results from Research Question 1, could potentially help explain why males increased their BMI. The average college student's dietary intake consists of high levels of fat, saturated fat, cholesterol, and sodium all of which can increase weight with large consumption (Ha & Caine-Bish, 2009). Given this, the larger meals consumed by males would usually consist of more calories, fat, carbohydrates, sodium, etc. all of which can have a negative impact on weight, and thus BMI. They are rather high, or at least are substantial. Although the males in this study participated in more physical activity than the females (see Table7), this physical activity may not be sufficient enough for the amount of food they are consuming. Scott et al. (2009) reported that one third of college students become inactive within the first three weeks of attending a university. While the results of this study and previous studies suggest that college students gain weight while in college, future research should determine why males' weight increases more than females. Furthermore, future studies should also examine if females' weight is more likely to decrease during college and what the contributing factors are to this weight change.

Research Question 3

What are the perceived social and physical environment factors and associated self-efficacy levels for weight and nutrition behaviors among college students? Are there differences across class years and between males and females?

Examination of the perceived social and physical environment constructs of the SCT provided a better understanding of the situation and environmental influences of nutrition behaviors and weight of the college students within this study. The examination of these SCT constructs provided more information on the perceptions of environment and the external factors that have been shown to contribute to differences in weight and nutrition behaviors of college students. Previous studies have confirmed that psychosocial and environmental factors are contributing factors of the nutrition behaviors and weight change among college students (Ha & Caine-Bish, 2009; Brunt & Rhee, 2008; Moczulski et al., 2007; Strong et al., 2008; LaCaille et al., 2011). Social environment has also been reported to have the greatest effect on healthy eating behaviors of college students (Sands et al., 1998). In this study, social situation, perceived environment, of college students was examined by assessing the average number of people with whom a student ate with per week. Results from this study indicated that there was a significant difference in the average number of people with whom students ate with per week across the class years. Specifically, first year undergraduate students ate with significantly more people than third year and fourth/fifth year undergraduate students. Additionally, second year undergraduate students also reported eating with significantly more people than third and fourth/fifth year undergraduate students. These results show that social situation does vary across class

years. Differences in the average number of people with whom a student ate meals with per week between the first year undergraduate students and the third and fourth/fifth year undergraduate students may be associated with the environmental factor that first year college students are more likely to live on campus thus their meals are mainly consumed within a dining hall where they are usually eating with other students. The third and fourth/fifth year students who live off campus do not consume as many meals within a dining hall and are more likely to eat elsewhere with potentially fewer fellow students. Refer to discussions later in this section for additional information regarding the different eating environments of college students. There was not a significant difference in average number of people with whom students ate with for males and females. Previous studies have suggested that social norms and environment were significantly associated with the nutrition behaviors of college students. Although these studies did not examine the differences across the class years or by gender, these studies revealed that social norms and environmental factors were positively associated with the nutrition behaviors of college students. Social support and available resources within their environment (fruits, vegetables, positive reinforcing factors, etc.) increased the students' likelihood to adopt healthy nutrition behaviors (Ball et al., 2010; Strong et al., 2008). Future research should examine reasons why students eat meals with other students, such as social norms, and determine if there are differences between males and females, which could provide additional insight into situation characteristics that could contribute to the number of people with whom a student eats his/her meals.

This study shows that a majority of first year undergraduate students live on-campus (*n*=30; 96.8%) and a majority of second (*n*=208; 85.3%), third (*n*=88; 82.2%),

and fourth/fifth (*n*=58; 93.5%) year undergraduate students live off-campus. Studies have reported that students who lived off-campus in comparison to those who lived on-campus had increased health risks to include a higher BMI and poorer nutrition behaviors (Brunt & Rhee, 2008). Studies have also reported that students who lived on-campus ate more fruits and vegetables and had healthier nutrition behaviors (Chung & Hoerr, 2005; Hicks & Heastie, 2008; Adams & Colner, 2008). Although this study did not examine relationships between living arrangements and nutrition behaviors of college students, the SCT construct of environment was examined in this study. In this study environment was examined through measurement of the reported total number of meals a student prepared, ate at a restaurant, and ate at a dining hall per week. There was a significant difference in the total number of meals prepared, eaten at a restaurant, and eaten a dining hall across the class years. These results support the previous findings that there is a difference in eating environments across class years. This study also indicated that with an increase in the class year there was an increase in the number of times students ate at a restaurant and there was a decrease in the number of times a student ate at a dining hall.

Results from previous studies have also suggested that psychosocial and environmental factors have been associated with eating behaviors for both male and female college students (LaCaille et al., 2011). As previously stated, this study examined physical environment factors associated with nutrition behaviors through the measurement of the reported total number of meals a student prepared, ate at a restaurant, and ate at a dining hall per week. This study included a variable that has not been thoroughly researched in previous studies when comparing differences between males and females: the total number of meals a student prepared per week. Results of this study

indicated that there was a significant difference in the total number of meals prepared when comparing female and male students (p=0.013). There was not a significant difference in the total number of meals ate at a restaurant and the total number of meals ate at a dining hall per week between male and female college students. To examine differences in total number of meals a student prepared Mann-Whitney U Non-Parametric tests were performed for gender, where females prepared more meals per week (μ=8.87; *sd=5.68)* than the males (μ=7.49; *sd*=5.57). This result may reflect what has been reported in previous literature that the fear of being obese is associated with female students eating habits (McKinley, 2009). The difference in male and female total number of meals prepared may also be associated with the caloric intake differences between males and females (Donatelle, 2012). Males may feel as though they are not able to prepare enough food to meet their caloric needs. Females may feel more confident and comfortable preparing meals and desire to prepare their meals in attempts to eat smaller and healthier meals whereas males may feel less comfortable preparing their own meals and not attempt to eat smaller and healthier meals. Furthermore, cultural norms may contribute to the female's feeling expected to prepare meals and serve a more domestic role in comparison to the males. Future research should examine the differences in the motivating factors to prepare meals versus eating meals at a restaurant or dining hall between males and females.

Situation for weight and nutrition behaviors of college students were also examined through a scale assessing barriers to availability of healthy foods (Tucker et al., 2011). This subscale included items measuring the perceived barriers to the availability of fresh healthy foods, healthy snacks in the snack machines, and healthy food selections

at restaurants. The perception of the availability of healthy food has not been thoroughly researched among college students, thus this study is providing new data and a better understanding of the association between the SCT constructs and the nutrition behaviors of college students. The results of this study indicated that there were not significant differences in perceived barriers to availability of healthy foods across the class years (F=1.2332; df=3; p=0.298) or between males and females (F=1.139; df=1; p=0.286). A previous study reported that attitude, subjective norm, and PBC were associated with a college students' nutrition behavior (Blanchard et al., 2009). If a student has a negative attitude or view of the subjective norm and PBC towards healthy nutrition behaviors he/she may have a negative view to the availability of healthy foods as well. The current measures were designed to identify motivators of and barriers to the targeted health-smart behaviors among African American, Asian, Hispanic, and White adults. Future research could design measures that are more specific to college students and provide for a better examination of the differences across the class years and between males and females. These measures could include the barriers to the availability of healthy food in the dining hall, at restaurants and vendors around campus, and at the local grocery store or the availability to locate healthy food that is affordable, convenient, or accessible.

The SCT construct self-efficacy was also measured in this study to examine potential differences in self-efficacy regarding accessing healthy foods and overcoming social pressures to make healthy food choices for college students. Self-efficacy has been reported to be a significant factor in nutrition behaviors of college students (Strong et al., 2008; McKinley, 2009; Von ah et al., 2004; Sands et al., 1998). Results from previous studies revealed that self-efficacy was directly associated with and is a significant

predictor of healthy eating behaviors of college students (McKinley, 2009; Von ah et al., 2004). This study measured two levels of self-efficacy assumed to be related to the nutrition behaviors of college students to include self-efficacy of students with regards to availability of healthy foods and self-efficacy of students with regards to social pressures and making healthy food choices. Results of this study indicated that there were not significant differences in self-efficacy of students with regards to availability of healthy foods (F=2.006; df=3; p=0.0112) or the self-efficacy of students with regards to social pressures and making healthy food choices (F=0.514; df=3; p=0.673) across the class years. While there are no existing studies that thoroughly explain why self-efficacy may or may not differ across class years, there are studies that suggest first year undergraduate students may have adjustment problems to the change in environment from home to college, thus creating an impact on their self-efficacy in their ability to make healthy food choices (Hicks & Heastie, 2008; Levitsky et al., 2004). Also, as previously stated, the lack of a significant difference in the nutrition behaviors of college students between the class years may be contributed to the unequal distribution of the sample by class. Future research should include an equally distributed sample size to increase the likelihood that there will be significant differences in self-efficacy between the class years.

Significant differences for males and females were detected for self-efficacy of students with regards to availability of healthy foods (F=5.231; df=1; p=0.023), and differences between genders approached significance for self-efficacy to overcome social pressures and making healthy food choices (F=3.704; df=1; p=0.055). Males' self-efficacy to access healthy foods was higher (μ=25.78; sd=9.68) than females (μ=23.78; sd=9.0), and males also reported greater self-efficacy to overcome social pressures and

make healthy food choices (μ=27.28; *sd*=8.89) than females (μ=25.69; *sd*=8.33). Previous studies have reported that although females may have a more positive attitude toward eating healthy foods, females feel more social pressure to eat healthy which may impact their self-efficacy levels to overcome social pressures and the lack of availability of healthy foods (Ha & Caine-Bish, 2009; Backman et al. 2002; Dennison & Shepherd, 1995). These differences in self-efficacy levels may be contributed to the previously reported situation and environment factors, yet future studies should examine other potential social environment factors associated with the difference between male and female college students.

Implications

In general, results of this study reveal that there are some differences in weight and nutrition behaviors of college students across some class years and between genders. Preliminary BMI measurements, average meal size consumption, and weight change were significantly different (or approaching significant differences) for male and female college students. However, significant differences in these variables were not reported across the class years, yet, as previously mentioned this may be in part due to the unequal sample size distribution between the class years. Results also support the utility of the SCT in explaining the weight change and nutrition behaviors of college students. The SCT construct situation, as measured in this study, and the SCT construct of environment were significantly different across class years, where environment and self-efficacy were significantly different for males and females. In addition, findings of this study were consistent with results reported in other research supporting the utilization of the SCT

with regards to weight and nutrition behaviors of college students to include self-efficacy (Ha & Caine-Bish, 2009; Strong et al., 2008; Clifford et al., 2009) and one's perception of his/her social and physical environment (Ha & Caine-Bish, 2009; Brunt & Rhee, 2008; Moczulski et al., 2007; Sands et al., 1998; Strong et al., 2008; LaCaille et al., 2011).

This study is unique in that it examined weight, weight change, nutrition behaviors, and multiple SCT constructs with regards to weight and nutrition behaviors of college students and compared these variables across class years and by gender. This study furthered current research by providing insight into better understanding the roles of the SCT constructs environment (eating environment), situation (both the perceived social environment and perceived physical environmental barriers), and associated self-efficacy levels as they pertain to college students' weight change and nutrition behaviors. Researchers could benefit from a better understanding of the individual and social environmental factors associated with weight gain and dietary behavior in college students, and differences within sub-groups of college students. This information may help researchers understand which changes are responsible for college weight gain and develop interventions to improve the health behaviors of the population (Holm-Denoma et al., 2008). Understanding how these characteristics differ by gender and across class years will help guide future intervention design and implementation. The results of this study suggest that the SCT may be successfully applied in the efforts to maintain healthy behaviors for college students and the inclusion of SCT constructs in a weight management and/or nutrition intervention for college students may help increase participation in healthy nutrition behaviors. The application of the SCT could be implemented to design gender and/or class specific interventions that incorporate the use

of campus-wide campaign to improve the social and physical environment of campus life. The improvement of the campus environment for students would promote healthy nutrition behaviors and establish strategies and programs to facilitate weight maintenance for the college students.

Limitations

There were a number of limitations of this study. First, this study was a cross-sectional study, thus causality cannot be examined. Although this study determined that there were differences in the nutrition behaviors, weight, and weight change by gender and/or class year, the data cannot infer causation. The results of weight change were limited in this study because there was only six weeks between the two BMI measurements, and six weeks may not be enough time for significant weight change to occur among college students. A more accurate representation of the weight change and nutrition behaviors of college students could be attained through the use of a longitudinal prospective study following the students through all college years. A prospective study could also further validate the inclusion of the SCT in examining weight change and nutrition behaviors of college students. This study could be conducted with a sample of college students who are monitored over the course of their college career. This study could include the administration of a SCT-based assessment instrument and height and weight measurement on a semester basis to examine the change in nutrition behaviors and weight.

Second, this study relied on participants to honestly self-report their nutrition and physical activity behaviors and other SCT construct measures, thus there was potential

for response bias. Students might have inflated or underreported their nutrition behaviors and the SCT construct measures. Also, there may have been a lack of clarity on how to interpret and report food consumption and specific nutrition behaviors such as classifying one's meal size as light, moderate, or large. The potential for response bias might also be contributed to the use of a convenience sample of college students from a general health classes (HED 1145). While the students may be required to enroll in this course due to their majors, there may be students who enrolled in this course due to their interest in general health education, thus the students may be predisposed to previous knowledge of health behaviors, or might in general be healthier. The previous knowledge or the knowledge gained while enrolled in the course may have also generated some response bias from some of the students.

Another limitation was the potential lack of generalizability of findings and the selection bias associated with the use of convenience samples. Since this research used a convenience sample of college students from a general health classes (HED 1145) at one university in the south central United States, the results may not be generalizable to other college student populations. In addition to the study using a convenience sample, the sample size is fairly small (n=444) preventing the results from being generalizable to the college student population as a whole. Another factor that prevents this sample from being generalizable is a lack of diversity within the sample. This includes an unequal distribution of students in each class: first year undergraduate student (7.0%), second year undergraduate student (55%), third year undergraduate student (24.1%), and fourth/fifth year undergraduate student (14%). This lack of diversity within the sample also includes ethnicity – White (66%), Hispanic (12.6%), Black (8.8%), and Asian (8.8%). Future

research should include a sample size with a more equal sample distribution across class years to increase the likelihood that there will be significant differences in the weight change and nutrition behaviors of college students.

Future Research

The use of the SCT in this study contributed to and furthered research of the weight and nutrition behaviors of college students. In examining the individual and social environment factors regarding the nutrition behaviors and weight change of college students, this study provided results that will help researchers better understand the how to design and implement an intervention to improve the environmental factors of college students. The results of these research questions could also be incorporated into current health behavior prevention and intervention strategies to make programs more relevant for students. Since the results of this study reveal that there are differences between subgroups (gender and/or class year) of college students it would be beneficial to utilize survey questions that address more gender specific information regarding physiological differences between males and females, potential body image issues, motivating factors related to nutrition behaviors, and a broader range of situation and environment factors that contribute to nutrition behaviors. Additionally, rather than focusing on the design of a general health promotion program for an entire student population, future programs should be designed to address differences between subgroups so as to meet the specific needs of each subgroup. Focusing on specific subgroups may lead to an increase in the adoption of healthy weight and nutrition behaviors among college students and overall improved health of the American college population as whole. Continued research of the

application of the SCT could provide compelling support for nutrition education, distribution of literature on weight change and nutrition behaviors, and interventions for all college students to improve their nutrition behaviors. Future research should use the results of this study to see if relationships exist between the differences in the SCT variables examined in this study. These relationships should be examined to determine if there are similarities across class years and for males and females.

Finally, campus professionals may want to explore weight change and nutrition behaviors among college students who use their fitness facilities and services, live on- and off-campus, eat at the dining halls, and eat at on-campus restaurants. The results of this study support the utility of the SCT as a theoretical framework for future research projects and campus-wide interventions focusing on the weight change and nutrition behaviors of college students.

Conclusion

In general, the results of this research indicate the utility of the SCT in understanding differences in females and males and across class years for weight change and nutrition behaviors among college students. In addition, this study suggests that there are some differences in the weight change and nutrition behaviors of college students for class years and gender. The results of the Multinomial Logistic Regression Model indicated that weight change was approaching a significant difference between males and females. The results of the ANOVAs indicated that there was a significant difference in the average number of people with whom students ate meals per week between some of the classes, and in the total number of meals prepared by the students,

the total number of meals eaten at a restaurant, and the total number of meals eaten at a dining hall between class years. The results also reveal that there was a significant difference in the average meal size consumption, in the total number of meals prepared per week by the students, and in the self-efficacy of students with regards to availability of healthy foods between males and females. Results approached significance for differences in the self-efficacy with regards to social pressures and making healthy food choices between males and females.

This research was potentially limited by selection bias, self-reported nutrition behaviors and SCT construct measures, and a lack of generalizability. Despite these limitations, the results of this study support and will assist researchers, health educators, and other professionals in developing appropriate interventions and educational strategies and to help tailor campus marketing to engage more students in healthy behaviors and lead to the adoption of healthier behaviors of college students. This study provided new information and a better understanding of the factors associated with the weight change and nutrition behaviors of college students. The findings of this research also indicate that tailoring interventions based on class year and gender would be beneficial as the results show that several SCT constructs were significantly different by these factors.

APPENDICES

APPENDIX A

Assessment Instrument

Health Survey

Instructions

The following questions ask about various aspects of your health. Please select only one response unless instructed otherwise.

This survey is completely voluntary. You may choose not to participate or not to answer any specific questions. You may skip any question you are not comfortable answering.

Demographics

Date of birth: _____ How old are you? _____

What is your gender (please circle one)?

Male Female

What is your height in feet and inches? _____ Feet _____ Inches

What is your weight in pounds? _____Pounds

What is your year in school (please circle one)?

a. 1st year undergraduate
b. 2nd year undergraduate
c. 3rd year undergraduate
d. 4th year undergraduate
e. 5th year undergraduate
f. Graduate or professional
g. Not seeking a degree

What is your enrollment status (please circle one)?

a. Full-time
b. Part-time
c. Other

How do you usually describe yourself (please circle one)?

a. White, non Hispanic (includes Middle Eastern)
b. Black, non-Hispanic
c. Hispanic or Latino
d. Asian or Pacific Islander
e. American Indian, Alaskan Native, or Native Hawaiian
f. Biracial or multiracial
g. Other

What is your relationship status (please circle one)?

a. Not in a relationship
b. In a relationship but not living together
c. In a relationship and living together

Where do you currently live (please circle one)?

a. Campus residence hall
b. Other college/university housing
c. Parent/Guardian's home
d. Apartment complex
e. Rental house within a neighborhood
f. Other Off-campus housing

How far from campus do you currently live (please circle one)?

a. 1-5 minutes
b. 6-10 minutes
c. 11-15 minutes
d. 16-20 minutes
e. Greater than 20 minutes

Are you a member of a social fraternity or sorority (please circle one)? (e.g., National Interfraternity Conference, National Panhellenic Conference, National Pan-Hellenic Council, National Association of Latino Fraternal Organizations)

a. yes
b. no

How many hours a week do you work for pay (please circle one)?

a. 0 hours
b. 1-9 hours
c. 10-19 hours
d. 20-29 hours
e. 30-39 hours
f. 40 hours
g. More than 40 hours

How many hours a week do you volunteer (please circle one)?

a. 0 hours
b. 1-9 hours
c. 10-19 hours
d. 20-29 hours
e. 30-39 hours
f. 40 hours
g. More than 40 hours

What is your approximate grade average (please circle one)?

a. A
b. B
c. C
d. D/F
e. N/A

Within the last 12 months, have you participated in organized college athletics at any of the following levels? Please select **ALL** that apply.

a. Varsity
b. Club sports
c. Intramurals

Weight History

Do you consider yourself now to be…
(If you are currently pregnant, what did you consider yourself to be before you were pregnant?)

a. Overweight
b. Underweight
c. Average
d. About the right weight

Would you like to weigh…

a. More
b. Less
c. Stay the same

During the past 12 months have you tried to lose weight?

a. Yes
b. No

Eating Behaviors

Please answer the following questions based on your regular activities and lifestyle from the past semester at Baylor University or over the past summer break if you are a first semester college student.

For Snacks
How many snacks do you consume before dinner in a day?

a. 0

b. 1
c. 2
d. 3
e. 4
f. Other

How many snacks did you consume after dinner a day?
a. 0
b. 1
c. 2
d. 3
e. 4
f. Other

What was the average size of your before dinner snack?
a. Light
b. Moderate
c. Large
d. Did not eat

What was the average size of your after dinner snack?
a. Light
b. Moderate
c. Large
d. Did not eat

Average number of people with whom you ate pre-dinner snack?

_____

Average number of people with whom you ate post-dinner snack?

_____

Did you snack more or less before lunch compared to high school?
a. More
b. Less
c. Same

For Breakfast
What was the average size of your breakfast?
a. Light
b. Moderate
c. Large
d. Skipped or did not eat

The average number of people you ate breakfast with?

_____

Number of times per week you prepared yourself breakfast (in room, kitchen, etc.)?

_____

Number of times per week you ate your breakfast at an all-you-can-eat dining hall?

_____

Number of times per week you ate your breakfast at a restaurant (off Baylor campus)?

_____

For Lunch
What was the average size of your lunch?

a. Light
b. Moderate
c. Large
d. Skipped or did not eat

The average number of people you ate lunch with?

_____

Number of times per week you prepared yourself lunch (in room, kitchen, etc.)?

_____

Number of times per week you ate your lunch at an all-you-can-eat dining hall?

_____

Number of times per week you ate your lunch at a restaurant (off Baylor campus)?

_____

For Dinner
What was the average size of your dinner?

a. Light
b. Moderate
c. Large

d. Skipped or did not eat

Did the number of people you ate dinner with increase, decrease, or stay the same compared to high school?

a. Increase
b. Decrease
c. Same

Number of times per week you prepared yourself dinner (in room, kitchen, etc.)?

_____

Number of times per week you ate your dinner at an all-you-can-eat dining hall?

_____

Number of times per week you ate your dinner at a restaurant (off Baylor campus)?

_____

With regards to your meals at college did the duration of your meals:

a. Increase
b. Decrease
c. Same amount of time

Do you eat your meals as compared to high school:

a. Later
b. Earlier
c. Same time

Did the average size of your meal as compared to high school

a. Increase
b. Decrease
c. Stay the same

The average number or people you ate a meal with:

a. Increased
b. Decreased
c. Stayed at the same

The number of meals you ate per day:

a. Increased
b. Decreased
c. Stayed at the same

The number of snacks you ate per day:

a. Increased
b. Decreased
c. Stayed at the same

Do you think your weight changed since entering Baylor?

a. Increased
d. Decreased
e. Same

How many servings of fruits and vegetables do you usually have per day?
(1 serving = 1 medium piece of fruit; ½ cup fresh, frozen, or canned fruits/vegetable; ¾ cup fruit/vegetable juice; 1 cup salad greens; or ¼ cup dried fruit)

a. 0 servings
b. 1-2 servings
c. 3-4 servings
d. 5 or more servings per day

During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, and canned fruit

_____ Day
_____ Week
_____ Month

During the past month, how many times per day, week, or month did you eat cooked or canned beans, such as refried, baked, black, garbanzo beans, beans in soup, soybeans, edamame, tofu, or lentils. Do NOT include lone green beans.

_____ Day
_____ Week
_____ Month

During the past month, how many times per day, week, or month did you eat dark green vegetables for example broccoli or dark leafy greens including romaine, chard, collard greens or spinach?

_____ Day
_____ Week
_____ Month

During the past month, how many times per day, week, or month did you eat orange-colored vegetables such as sweet potatoes, pumpkin, winter squash, or carrots?

_____ Day

_____ Week
_____ Month

Not counting what you told answered about, during the past month, about how many times per day, week, or month did you eat OTHER vegetables? Examples of other vegetables include tomatoes, tomato juice or V-8 juice, corn, eggplant, peas, lettuce, cabbage, and white potatoes that are not fried such as baked or mashed potatoes.

_____ Day
_____ Week
_____ Month

On most days, where do you get your breakfast from?

a. A campus dining hall
b. A campus restaurant
c. Home (e.g., your apartment, house, dorm room, etc…)
d. Someone else's residence
e. A fast-food restaurant
f. A sit-down restaurant
g. A vending machine
h. Other
i. I don't eat breakfast

Most of the time, do you eat breakfast at the location you get it from, or do you eat it in route to somewhere else (e.g., class or a meeting)?

a. At the location I got it from
b. In route to somewhere else

On most days, where do you get your lunch from?

a. A campus dining hall
b. A campus restaurant
c. Home (e.g., your apartment, house, dorm room, etc…)
d. Someone else's residence
e. A fast-food restaurant
f. A sit-down restaurant
g. A vending machine
h. Other
i. I don't eat lunch

Most of the time, do you eat lunch at the location you get it from, or do you eat it in route to somewhere else (e.g., class or a meeting)?

a. At the location I got it from
b. In route to somewhere else

On most days, where do you get your dinner from?

a. A campus dining hall
b. A campus restaurant
c. Home (e.g., your apartment, house, dorm room, etc…)
d. Someone else's residence
e. A fast-food restaurant
f. A sit-down restaurant
g. A vending machine
h. Other
i. I don't eat dinner

Most of the time, do you eat dinner at the location you get it from, or do you eat it in route to somewhere else (e.g., class or a meeting)?

a. At the location I got it from
b. In route to somewhere else

On most days, where do you get your snacks from?

a. A campus dining hall
b. A campus restaurant
c. Home (e.g., your apartment, house, dorm room, etc…)
d. A fast-food restaurant
e. A sit-down restaurant
f. A vending machine
g. I don't eat snacks

Most of the time, do you eat your snack at the location you get it from, or do you eat it in route to somewhere else (e.g., class or a meeting)?

a. At the location I got it from
b. In route to somewhere else

Physical Activity

We are interested in two types of physical activity - **vigorous** and **moderate**. **VIGOROUS** activities cause large increases in breathing or heart rate while **MODERATE** activities cause small increases in breathing or heart rate.

Now, thinking about the **MODERATE** activities you do… In a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

b. Yes
c. No
d. Don't know/Not sure
e. Refused

How many days per week do you do these **MODERATE** activities for at least 10 minutes at a time?

a. 0 days
b. 1 day
c. 2 days
d. 3 days
e. 4 days
f. 5 days
g. 6 days
h. 7 days

On days when you do **MODERATE** activities for at least 10 minutes at a time how much total time per day do you spend doing these activities?

_____ Hours _____ Minutes

Now, thinking about the **VIGOROUS** activities you do… In a usual week, do you do vigorous activities for at least 10 minutes, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?

a. Yes
b. No
c. Don't know/Not sure
d. Refused

How many days per week do you do these **VIGOROUS** activities for at least 10 minutes at a time?

a. 0 days
b. 1 day
c. 2 days
d. 3 days
e. 4 days
f. 5 days
g. 6 days
h. 7 days

On days when you do **VIGOROUS** activities for at least 10 minutes at a time how much total time per day do you spend doing these activities?

_____ Hours _____ Minutes

If you work, when you are at work, which of the following best describes what you do?

a. Mostly sitting or standing
b. Mostly walking
c. Mostly heavy labor physically demanding work
d. I currently do not work

If you exercise or partake in any physical activity, please select the location or locations that you do most of your exercise at (please select all that apply).

a. University recreation center
b. University grounds (running trail, intramural fields, campus courts, pool, etc…)
c. Apartment exercise room
d. In your residence (e.g., in your apartment, dorm room, or house)
e. Private exercise facility (e.g., fitness gym with membership, etc…)
f. Outside around where you live (e.g., neighborhood, etc…)
g. Public park in town
h. Other _____
i. I don't ever exercise

Self-Efficacy for *Eating Behaviors*

Using the scale below as a yardstick, please select the answer that best describes how confident you are that you could do the following:

I can resist eating when I am anxious (nervous).

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I am resist eating when I am depressed (or down).

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can resist eating when I am angry (or irritable).

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can resist eating when I have experienced failure.

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can control my eating on the weekends.

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can resist eating when there are many different kinds of food available.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating even when I am at a party.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating even when high-calorie foods are available.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating even when I have to say “no” to others.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I feel it’s impolite to refuse a second helping.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating even when others are pressuring me to eat.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating even when I think others will be upset if I don’t eat.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I feel physically run down.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I have a headache.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I am in pain.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I feel uncomfortable.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I am watching TV.

Not Confident Very Confident

0 1 2 3 4 5 6 7 8 9 10

I can resist eating when I am reading.

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can resist eating just before going to bed.

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

I can resist eating when I am happy.

Not Confident										Very Confident
0	1	2	3	4	5	6	7	8	9	10

Situation (perceived environmental barriers)

Healthy Foods and Snacks

Think about when you eat healthy foods and healthy snacks. Healthy foods and snacks are low in fat, calories, and sugar. There are many healthy foods and snacks. These are just some examples of healthy foods and snacks:

-A turkey or chicken sandwich instead of a hamburger
-Salad with vinaigrette instead of ranch/blue cheese dressing
-Eating baked or grilled fish instead of meats higher in fat (like beef, lamb, or pork)
-A meal with vegetables instead of a meal with no vegetables
-Pretzels, nuts, popcorn (without butter and salt) instead of chips
-A piece of fruit as a snack instead of cookies
-Low-fat frozen yogurt instead of ice cream
-Steamed broccoli and rice instead of fried rice
-A bean burrito instead of a beef burrito
-Baked chicken or fish instead of fried
chicken or fish

When I do not eat healthy foods (like fruits, vegetables, and lower calorie snacks), it is because…

…when there are unhealthy foods at home, it is hard to choose healthy foods.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…when I think "healthy food," I think "tastes bad."

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…fresh healthy foods are not easily available.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…when I go to the grocery store, I do not specifically think about buying fruits or vegetables.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I get cravings for unhealthy foods.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I do not like the taste of most vegetables.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I cannot get healthy snacks in the snack machines.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I do not like to try new fruits or vegetables that I have never had before.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…when someone cooks or gives me unhealthy food, I eat it.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I do not look or feel any different when I eat healthy.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I crave sweets or junk food instead of fruit as a snack.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I just do not care about eating fruits and vegetables every day.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…when I make or buy a meal, I do not think about whether or not it has fruits or vegetables in it.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…healthy foods are not easy to find at restaurants.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

…I just do not care about eating healthy every day.

Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
1	2	3	4

Situation (perceived social environment, social norms)

Lots of Baylor students I know eat fast food often.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

Lots of Baylor students I know drink soft drinks often.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

Lots of Baylor students I know eat healthy food when they are out.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

Alcohol Use

The last time you "partied"/socialized how many drinks of alcohol did you have?

_____ Drinks

The last time you "partied"/socialized over how many hours did you drink alcohol?

_____ Drinks

How many drinks of alcohol do you think the typical student at your school had the last time he/she "partied"/socialized?

_____ Drinks

Within the last 30 days, on how many days did you use:
Alcohol

a. Never used
b. Have used but not in the last 30 days
c. 1-2 days
d. 3-5 days
e. 6-9 days
f. 10-19 days
g. 20-29 days
h. Used daily

Tobacco Use

Within the last 30 days, on how many days did you use:
Cigarettes?

a. Never used
b. Have used but not in the last 30 days
c. 1-2 days
d. 3-5 days
e. 6-9 days
f. 10-19 days
g. 20-29 days
h. Used daily

Tobacco from a water pipe (hookah)?

a. Never used
b. Have used but not in the last 30 days
c. 1-2 days
d. 3-5 days
e. 6-9 days
f. 10-19 days
g. 20-29 days
h. Used daily

Cigars, little cigars, clove cigarettes?

a. Never used
b. Have used but not in the last 30 days
c. 1-2 days
d. 3-5 days
e. 6-9 days
f. 10-19 days
g. 20-29 days
h. Used daily

Smokeless tobacco?

a. Never used
b. Have used but not in the last 30 days
c. 1-2 days
d. 3-5 days
e. 6-9 days
f. 10-19 days
g. 20-29 days
h. Used daily

Thank you for taking the time and thought to complete this survey! We appreciate your participation.

APPENDIX B

Informed Consent

Informed Consent Form

Title of Research: Weight gain in college students: When does it happen and why?

Principal Investigator: Kimber Dillon. Graduate Teaching Assistant in the Department of Health, Human Performance, & Recreation housed within the School of Education, at Baylor University.

Faculty Principal Investigator: Dr. M. Renée Umstattd. Assistant Professor in the Department of Health, Human Performance, & Recreation housed within the School of Education, at Baylor University.

Sponsor: N/A

Thank you for expressing an interest in participating in this survey and height and weight measurements. Before you decide to participate in this project, it's important that we explain the procedure clearly to you.

Explanation of Procedures:

Researchers at **Baylor University** are interested in exploring body weight of Baylor students and determining factors related with weight during the first year of college in comparison to weight during non-first years of college (e.g., the 2nd or 3rd year of college, etc…). The research findings from this project will be used to help inform the development of future health promotion strategies for students at Baylor University.

What will you be required to do?

The study is focused on all Baylor University students 18 years of age or older enrolled in HED 1145 in the fall of 2011, so all students with this classification will be offered the opportunity to participate. You are invited to participate in height and weight measurements and complete a series of health surveys. The health surveys will be administered in class at the beginning of the fall semester and at the end of the fall semester. There will also be a final 6-month follow-up health survey conducted online mid-Spring 2012 semester. Each survey will take approximately 20-25 minutes to complete and you will be asked questions regarding your dietary habits, physical activity, height and weight measurements, and other related health questions. Participation is voluntary and consent is indicated by signing and turning in this informed consent form.

Risks:

One potential risk of participating in this study is that you might not like to answer questions about your current eating behaviors, physical activity levels, or health, and related health status. Another potential risk is that you may feel uncomfortable with participating in the height and weight measurements that will be conducted

with this study. However, this information will be provided directly to you and will be kept completely confidential.

Benefits:

Through participating in this study, you could gain a better understanding of how your current eating behaviors and physical activity affect your health. Since you will be provided with your weight measurements, you will be able to see any changes you have from the beginning to the end of the project, which could help you in making decisions about possible health behavior changes in your life. You could also benefit by simply knowing that your participation in this study contributes to the enhancement of scientific understanding and knowledge, which will help in the creation of future programs.

Rights as a Participant:

The information you provide will remain secret and private**.** Any identifying information you choose to provide (name and email) will not be kept with any collected survey data. Information obtained through this study will only be used by the research staff. All data will be stored in using password protected computers and/or websites, and/or locked filing cabinets. Please know that your **participation is voluntary.** If you choose not to take part in the study, there will not be a penalty. And, you may quit the study at any time. If you choose not to participate, the information that has been told to us will be kept secret and private and will not be shared with your HED 1145 instructor. Your choice to take part in this study (or to not help) will not reflect on you as a student of HED 1145 or a student of Baylor University.

The Baylor University Institutional Review Board (a group that looks out for the fair and just treatment of people in research studies) will review study records from time to time. This is to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Cost:

The only cost to you is the time you will spend completing the surveys and participating in the height and weight measurements.

Payment for Participation in Research

There is no additional compensation or incentive offered for taking part in this study. Your help with this study will provide researchers with information on current eating and physical activity behaviors of college students. Other universities interested in improving the health of their students could also find the information obtained in this study of use.

Questions or Problems:
For more information concerning this research you should contact Dr. M. Renée Umstattd at (254)710-4029; One Bear Place #97313, Waco, Texas 76798; Renee_Umstattd@baylor.edu. Dr. Umstattd is an Assistant Professor of Health Education in the Department of Health, Human Performance, & Recreation at Baylor University. If you have any questions about your rights as a research participant, you may contact Baylor's University Committee for Protection of Human Subjects in Research. The chairman is Dr. Michael Sherr, One Bear Place # 97320 Waco, TX 76798-7320, (254)710-4483.

STATEMENT OF CONSENT
I have read this consent document. I am 18 years of age and by signing below," I understand its contents and freely consent to participate in this study under the conditions described.

Printed Name: _____

Signature: _____ **Date:** _____

Investigator Signature: _____ **Date:** _____

*** Additional Participant Information ***

Phone _____

Email _____

APPENDIX C

Request for the Approval of Research Involving Human Subjects

Proposal

Title of the research project/teaching exercise: Weight gain in college students: When does it happen and why?

Are you using subjects in research? Yes (yes or no)

Are you using subjects in teaching exercises? No (yes or no)

Part 1: Expedited Review Request (if applicable)

The Baylor University Committee for Protection of Human Subjects in Research (Institutional Review Board or (IRB) has agreed to perform expedited reviews of certain research proposals that involve only survey research that poses minimal risk to research subjects. Proposals handled through the expedited review process are held to the same standard as those that go through the normal review process.

☒ I have reviewed the research or teaching exercise listed above. In my opinion, this proposal meets all three of the following criteria required for expedited review by the Baylor University Committee for Protection of Human Subjects in Research:

1. The only involvement of research subjects in the proposed research/teaching activity is response to written, oral, or electronic surveys;
2. The information requested in these surveys does not include any highly personal or sensitive information (reports of criminal activity or sexual behavior); and
3. The activity poses minimal physical and psychological risk to the research participant.

Part 2: Introduction and Rationale

Describe the research background and rationale for the project:

(Limit 500 words)

Introduction and Rationale

Weight gain among college freshmen students is a national public health problem. Overweight and obesity have been linked to the increasing rates of diabetes, heart disease, hypertension, stroke, and certain cancers and has become a burden on national health care systems (Holm-Denoma, et al., 2008). Most of these medical conditions associated with overweight and obesity are preventable and could be avoided with proper nutrition and physical activity. The freshman year of college is now being perceived as a critical period of weight gain and in establishing lifestyle behaviors and patterns that are contributed to overweight and obesity (Anderson, Shapiro, & Lundgren, 2003). Research suggests that American young adults in their early 20's gain approximately 1.5 pounds per year and then it begins to level off (Lewis et al., 2000). The transition from home to college may be one of the most dramatic changes a college student has ever experienced with a change in environment, restrictions (or lack there of), social norms and exposures, and behaviors (Holm-Denoma, et al., 2008). An increase in calories, poor dietary choices, minimal physical activity, and stress are some of the leading contributors to weight gain among college freshmen (Levitsky, Halbmaier, & Mrdjenovic, 2004). Another contributor to weight gain and other health issues is alcohol consumption, which has become a wide-spread problem on many college campuses nationwide with 60% of college students reporting some level of monthly consumption of alcohol (American College Health Association [ACHA], 2009).

Researchers are beginning to observe that weight gain in college freshmen is considerably greater than the rest of the adult population (Levitsky et al., 2004). Although college freshmen may not gain the alleged "freshman fifteen" studies have shown that some do gain 3-6 pounds in their first semester of college. This rate of weight gain is 5.5 times the reported weight gain for the general population (Mihalopoulos, Auinger, & Klein, 2008). This level of weight gain and the behavior patterns during college, especially freshman year, may contribute to the student becoming overweight or obese come adult-hood (Jung, Bray, & Ginis, 2008). Effective public health interventions are needed to improve the health behaviors of college students to prevent them from

becoming an overweight or obese adult. Identifying the environmental factors associated with weight gain in college freshmen may help researchers understand which changes are responsible for the weight gain and develop an intervention to improve the health behaviors of the population (Holm-Denoma et al., 2008).

The Social Cognitive Theory (SCT) has been successfully used to determine weight change and behavioral changes in college students (Anderson, Winett, & Wojcik, 2007). The SCT was designed by Albert Bandura to explain human behavior as observational, dynamic, and a reciprocal interaction of personal factors, behaviors, and the environment (Anderson et al., 2007). The SCT poses that human behavior is based on reciprocal determinism of the continuous interaction of behavior, personal factors, and environment. A number of SCT constructs are consistently related with weight-loss and management behaviors, including self-efficacy, outcome-expectancy value, self-regulation, and one's perception of his/her social and physical environment (Anderson, Winett, & Wojcik, 2007).

Clearly outline the questions being addressed:

(Limit 250 words)

Purpose:

The purpose of the proposed study is to examine body weight of Baylor students, to determine factors correlated with weight change during the first year of college, and to examine potential differences between first-year college students and non-first year college students.

Research Question 1: Are there and what are the differences in weight change between first-year college students as compared to non-first year college students?

Research Question 2: What are the preliminary weight, physical activity and nutrition behaviors of college first-year students at the beginning of the fall semester and how do they compare non-first year college students?

Research Question 3: How do physical activity and nutrition behaviors of college students at the end of the fall semester differ from the beginning of the semester?

Research Question 4: What are the perceived physical and social environment factors that are related with weight change in the first year of college and are these significant after controlling for other SCT variables consistently related with weight change?

Describe any expertise you have in this area or research or teaching:
Kimber Dillon will serve as the principle investigator of this study and has research and teaching expertise on the promotion of health and quality of life among college students. Kimber Anderson serves as a graduate teaching assistant and research assistant in the master of public health degree program at Baylor University. She holds a bachelor's degree in community health education and will graduate from Baylor's MPH in Community Health Education program in May of 2012. Her research and teaching expertise focuses on promoting health and quality of life among college students and adolescents. She teaches university students in a university wellness course and has worked with adolescents to address a variety of health issues (e.g., total wellness, physical activity, nutrition, body composition and image, sexual health, infectious diseases, drugs, tobacco, and alcohol). She has served as a project coordinator and research assistant for the Baylor Walk@Work Program (under Dr. M. Renee Umstattd) and various studies regarding health promotion among autistic individuals (under Dr. Beth Lanning). She is currently a project coordinator and member of the research team for the Baylor in Brazil program (under Dr. Eva Doyle).

Dr. M. Renée Umstattd will serve as the faculty principle investigator and faculty advisor of this study and has research expertise focusing on the promotion of health and quality of life across the lifespan through physical activity. Specific research expertise areas include examining relationships among theoretical determinants of physical activity from a social cognitive and ecological perspective; implementation and evaluation of

theoretically based physical activity interventions and the translation and dissemination of efficacious physical activity interventions into community settings.

Cite relevant research (including your own) in a bibliography:

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Part 3: Methodology

Thoroughly describe the methodology to carry out the project/teaching exercise:

Methodology

This study will include all Baylor University students 18 years of age or older enrolled in HED 1145 in the Fall of 2011, thus all students with this classification will be offered the opportunity to participate. A letter of support is attached from Shannon Carl, the HED 1145 Coordinator. All HED 1145 Baylor students will be invited to participate in height and weight measurements and to complete a series of *health surveys* preceded by completing an informed consent form with detailed information regarding the purpose and protocol of the study. Participation is voluntary and consent is indicated by completion and submission of the informed consent form. A third party with no access to student participants' grades will recruit students for participation in the study. The course

instructors for all sections of HED 1145 will not be present for data collection or have knowledge of which student participants agreed to participate in the study and which students declined to participate in the study. Course instructors will NEVER have access to individual survey responses that have any student identification attached to them before final grades are submitted for the fall 2011 semester. To help ensure that student confidentiality is maintained the following procedures will be followed:

- All *health surveys* and informed consent forms will be labeled with identification numbers prior to survey administration.
- Upon *health survey* completion, informed consent forms and *health surveys* will be collected separately by a research team member that does not teach HED 1145.
- Informed consent forms will be placed in sealed manila envelopes not to be opened until after grades are submitted at the end of the fall 2011 semester.
- Given this approach, all completed *health surveys* will be de-identified.
- After data collection is completed, all *health surveys* and informed consent forms will be stored separately in locked filing cabinets that will be accessible only by project investigators.
- The 2nd survey will include identifying information to allow for data matching and comparison across time points. Given this, all *health surveys* completed at the end of the fall semester will be placed in sealed manila envelopes and stored in a locked filing cabinet until all final grades have been submitted for the fall 2011 semester.
- After matching data between the 1st and 2nd survey, all identifying information will be removed from the data. All identifying information will be stored in a separate data file from survey data in a password locked computer.
- Upon completion of the fall 2011 semester, informed consent forms will only be used to match data and recruit for the 3rd *health survey* sampling point.
- As soon as data is matched after the 3rd *health survey* sampling point, all identifying information will be removed from all datasets and identifying information will only be used to recruit participants to complete the 3rd *health survey*. In this phase identifying information will be stored in a separate data file from survey data in a

password locked computer.

- After the 3rd *health survey* has been completed and data has been matched across time points, all identifying information will be destroyed. This will occur by May 2012.

There are four data collection points of the proposed study (please see specific time points below). Prior to the commencement of data collection, informed consent forms will be completed. The informed consent form will include detailed information regarding the purpose and protocol of the study.

- At the beginning of the fall semester *health surveys* will be disseminated and a height and weight measurement will occur using the same scales and stadiometers for all measurements. These measurements will occur either in a separate classroom or outside of classrooms using privacy screens. Each student will receive a written record of his/her measurements. All height and weight measurements will be conducted by trained research staff. Please see Appendix for the height and weight measurements form. Please see Appendix for *health survey* items.
- Mid-semester a second height and weight measurement will occur in association with the HED 1145 Physical Assessment Day at the McLane Student Life Center (SLC). Use of data for study purposes is completely voluntary and will be indicated by informed consent form completion. Please see Appendix for the height and weight measurements form.

Height and weight measures are taken in conjunction with the HED 1145 class, therefore if a student chooses to participate in the study, this information will be recorded for two purposes, the course requirement and study participation. Again, if the student is participating in the study this information will be recorded by a 3rd party researcher to maintain confidentiality of the student.

- A third height and weight measurement and a three-month follow-up *health survey*

will occur at the end of the fall semester.

- Recruitment for a final height and weight measurement and a six-month follow-up *health survey* will occur in the middle of the following spring semester via email. Please see Appendix for recruitment email wording.

Inclusion criteria for participation in the proposed study:

- The person must be a student at Baylor University in the fall of 2011 and enrolled in HED 1145. HED 1145 consistently has first-year and non-freshman students enrolled each semester. Non-first year student participants will be included as the comparison group to test hypotheses regarding differences between first-year and non-first year students.
- The person must consent to participating in the study by completing the consent form.
- The person must be 18 years of age or older.

As previously mentioned, all collected data will be stored in a secure password protected computer and/or website, or in a locked filing cabinet. All identifying information will be stored separately from other collected information. All information will be confidential and only anonymous summary data will be reported. All data will be de-identified and participants will be assigned a unique identification number that will replace identifying information within datasets. Upon final matching of the data, all identifying information will be destroyed via shredding and permanent deletion of electronic files (by May 2012).

Data collection

There are four data collection time points in the proposed study. Recruitment and study methodologies for the first three data collection points will have similar methods, but the fourth data collection point will use a secure online version of the survey administered in the previous data collection points of the proposed study.

- The first data collection point will occur at the beginning of the fall semester in conjunction with the HED 1145 classes. The HED 1145 instructor will be asked to leave the classroom and the researcher/proctor will provide the students with the consent form and a *health survey*. The researcher/proctor will gather the height and weight measurements of each student in the class while they are completing the *health survey*. As previously described all completed *health surveys* and informed consent forms will be collected separately and informed consent forms will be sealed in a manila envelope.
- The second data collection point will occur in the middle of the fall semester in conjunction with the HED 1145 Physical Assessment Day at Baylor's SLC. To maintain confidentiality, the researcher/proctor will gather a separate height and weight measurements form from each student who completed an informed consent form at the HED 1145 Physical Assessment Day.
- The third data collection point will occur at the end of the fall semester in conjunction with the HED 1145 classes. The HED 1145 instructor will be asked to leave the classroom and the researcher/proctor will provide the students with the *health survey* and gather the height and weight measurements of each student in the class while they are completing the *health survey*. To allow for data matching, these *health surveys* will include identifying information (name and email; please see the Appendix for 2nd *Health Survey* cover sheet). All *health surveys* collected at this time point will be sealed in a manila envelope and stored by the faculty advisor until all final grades have been submitted for the fall 2011 semester. Upon grade submission, all data will be entered. After survey 2 data is matched with the 1st *health survey* data, all identifying information will be removed and replaced with the participant identification number. As previously mentioned, since identifying information will be collected to allow for comparison with the previous administered *health survey*, after data matching is completed all identifying information will be stored securely and separately from data using locked filing cabinets or password protected computers only accessible by study investigators.

- The fourth data collection point will administered through an online version of the *health survey*. The link to the *health survey* will be emailed to all students who participated in the study to be completed as the final survey for the study (Please see Appendix for email). The survey website downloads data into a useable format (Microsoft Access or Excel, or SPSS). Since identifying information will be collected to allow for comparison with the previous administered surveys, all identifying information collected will be stored securely and separately from data.

Survey Instrument

A survey will be used for the proposed study. This *health survey* will be administered three times, twice to the students in the classroom and a third time as a 6-month follow-up online survey. The *health survey* is the product of combining existing instruments with established reliability and validity (please see the Appendix). These include measures to describe weight status, physical activity engagement, nutrition behaviors, social cognitive factors, demographic information and other health behaviors. Please see the survey descriptions and item measures included in the Appendix.

How many subjects will be used? Please see the Methods description.

How will the subjects be recruited?

Recruitment:

Recruitment will take place in the HED 1145 classrooms. A third party with no access to student participants' grades will recruit students for participation in the study. The course instructors for all sections of HED 1145 will not be present for data collection or have knowledge of which student participants agreed to participate in the study and which students declined to participate in the study. Students will be informed that they will not be penalized for choosing not to participate, nor will the answers that they submit be available to anyone other than the principal investigator and research staff. Course instructors will NEVER have access to individual survey responses that have any student

identification attached to them before final grades are submitted for the fall 2011 semester.

Possible risks to the subjects (both physical and psychological):

Potential Risks:
Risks for participation in this study are minimal. However, participants could potentially feel uncomfortable with participating in the height and weight measurements as well as answering questions regarding their current eating behaviors, physical activity levels, or health, especially if they are not comfortable with their current eating behaviors, activity levels, or health.

Method(s) to limit risks:

Risk Minimization:
Each participant will be given the opportunity to withdraw from the study at any time and participation in the study is entirely voluntary.

All height and weight measurements will occur either in a private room or in an area with privacy screens to help reduce potential discomfort. Students will also be directly provided with a written record of their height and weight.

All data will be collected by a 3rd party not involved in teaching HED 1145. All data will be completely de-identified whereby an identification number is assigned to each participant. Identifying information will be stored by the faculty advisor within a locked computer file (the faculty advisor does not teach HED 1145). The course instructors for all sections of HED 1145 will also not be present for data collection or have knowledge of which student participants agreed to participate in the study and which students declined to participate in the study. Course instructors will NEVER have access to

individual survey responses that have any student identification attached to them before final grades are submitted for the fall 2011 semester.

Benefits:

Participant:
Participants will benefit from this study by having a better understanding of how their current eating behaviors and physical activity affect their health. Participants will also be able to see how their health behavior progress from the beginning to the end of the study which could help them to determine if they need to make health changes. Participants could also benefit by simply knowing that their participation in this study contributes to the enhancement of scientific understanding and knowledge.

Researchers, Health Professionals, Community Planners: Findings from the proposed research have several implications for researchers, health professionals, campus planning, and community planning teams. First, this research will provide a better understanding of current eating and physical activity behaviors of college students, including freshmen. Second, other universities interested in improving the health of their students could also use the information obtained in this study.

Risk/Benefit Ratio: Though there are some mild psychological risks to participants (annoyance, reflection on current eating behaviors, physical activity levels, and health); the benefits to the proposed research to the participants and society at large outweigh the risks.

Proposed safeguards to protect the subjects' right to privacy:

All participant information gathered through the height and weight measurements and survey will remain confidential and will be stored in a secured area (password protected

computer and/or locked filing cabinet). Throughout the course of the study, all identifying information will be stored separately from collected data in a secure location. All data will be de-identified and participants will be assigned a unique identification number that will replace identifying information within datasets. Participants will be notified of this in the informed consent form.

In addition, course instructors for all sections of HED 1145 will not be present for data collection or have knowledge of which student participants agreed to participate in the study and which students declined to participate in the study. Course instructors will NEVER have access to individual survey responses that have any student identification attached to them before final grades are submitted for the fall 2011 semester.

Outline the method(s) to be used to obtain the data, to analyze the data, and to disseminate the results of the research project:

All collected data will be stored in a secure computer or in a locked filing cabinet. All identifying information will be stored separately from other collected information. All information will be confidential and only anonymous summary data will be reported. All data will be de-identified and participants will be assigned a unique identification number that will replace identifying information within datasets. The data collected may be published in such a way that identifying information (name, email, phone, etc...) is not used, and that participants cannot be identified in any way. (Please see the description provided in the beginning of the *Methodology* section for more specific details.)

Data analysis for this study will be conducted using SPSS and will include the following for the four research questions.

Research Question 1: Are there and what are the differences in weight change between first-year college students as compared to non-first year college students?
Planned analyses: t-test/ANOVA

Research Question 2: What are the preliminary weight, physical activity and nutrition behaviors of college first-year students at the beginning of the fall semester and how do they compare non-first year college students?
Planned analyses: Frequencies, t-test/ANOVA

Research Question 3: How do physical activity and nutrition behaviors of college students at the end of the fall semester differ from the beginning of the semester?
Planned analyses: t-test/ANOVA

Research Question 4: What are the perceived physical and social environment factors that are related with weight change in the first year of college and are these significant after controlling for other SCT variables consistently related with weight change?
Planned analyses: bivariate correlation coefficients, multiple regression models predicting change in weight, hierarchical regression analysis predicting change in weight

Part 4: Informed Consent Form Checklist

When using humans as subjects in research you must obtain their informed consent. Please upload a copy of your Informed Consent Form before submitting your proposal

I verify that the following items appear on my Informed Consent Form:

☒ A statement explaining the purpose of the research.

☒ A statement of the expected duration of the subject's participation.

☒ A description of the procedures to be followed.

☒ A description of any reasonable foreseeable risks or discomforts to the subject, including invasion of privacy.

☒ A description of any benefits resulting from the research, either to the subject or to others.

☒ A statement that informs subject of his/her right not to be a subject in a research project that is also a teaching exercise.

☒ A statement informing subject about how his/her anonymity will be guarded; i.e., that their confidentiality will be protected by assigned code numbers, by limiting access to data, by locked storage of files, etc.

☒ A statement that the subject's participation is voluntary, and that his/her refusal to participate will involve no penalty or loss benefits to which the subject is otherwise entitled, and that the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled.

☒ A disclaimer, if applicable, regarding the use of the Internet to collect data.

☒ For research involving more than minimal risk, an explanation regarding the availability of any compensation or any medical treatments if injury occurs (if applicable, see OHRP Reports).

☒ If written informed consent is required, a place for the subject to sign and date the form and a statement that a copy of the signed consent form will be given to the subject for his/her records.

☒ If the subject is a minor, a statement of parental responsibility in consenting to the child's participation in the study with a place for the parent to sign and date the form in addition to the participant's signature.

☒ The name, address, and telephone number of the principal investigator of the research project, and his/her affiliation with Baylor University. If the principal investigator is a graduate student, the name and telephone number of the faculty advisor is also required.

☒ A statement informing subject that inquiries regarding his/her rights as a subject, or any other aspect of the research as it relates to his/her participation as a subject, can be directed to Baylor's University Committee for Protection of Human Subjects in Research.

Part 5: Research Instrument(s)

Please upload any non-standard, newly developed interview or questionnaire instrument (one that has not been previously published) that will be used also Upload as appendices any other information pertinent to the proposal, such as consent letters from participating agencies, etc.

IMPORTANT:

You must share your proposal with your Faculty Advisor and Department Chair using the "Share this Project" feature in IRBnet. If your Faculty Advisor or Department Chair is not listed as an IRBnet user, contact them and have them register with IRBnet so you can share your project with them. Your Faculty Advisor and Department Chair must sign your project within IRBnet before submitting the proposal to the IRB.

APPENDIX D

Proctor Instructions

Instructions for Administering the Surveys

Methods:

Set-Up

1. Prior to class, the proctor will be made aware of the procedures of the survey and the location of the height and weight station so she will know where to direct the participants to go receive his/her measures. (Refer to the attached document for height and weight station locations.)
2. The proctor will inform the class that another instructor will come into the classroom to proctor the survey and then she will return to conduct class as usual.
3. The proctor will then switch classrooms to administer the survey to a class that she does not teach. This schedule will be provided separate from this document.
4. The survey packets will be given to the proctor or placed in the classroom prior to the beginning of class.
5. The proctor will conduct and gather the survey packets to be given to Kimber or Dr. Umstattd and then return to her usual class.

Conducting the survey

6. The proctor will provide the information in the section entitled "Using these instructions" to all the participants after passing out the survey packets.
7. Each participant will receive a packet that contains an Informed Consent Form, the Health Survey, and a Height and Weight Form. These must be kept together at all times for identification and research procedure purposes. The Informed Consent Form will be removed and collected separately yet still kept in the same order.
8. Each participant needs to use pen or pencil in order to successfully complete the survey.
9. Upon completing the survey each participant will receive his/her height and weight measures at the designated location.
10. Upon receiving the height and weight measures the participant will give the packet to the proctor and return to his/her seat.
11. The proctor will gather all of the participant's packets, place them in the

designated location, and return to her class.

Using these instructions

Before passing out the survey packets provide the students with the following information: Please ensure that you convey the following information to **all** participants completing the survey. **The text in *italics* is to be read out directly to the participants**. Begin the class with passing out the survey packets. Then read the following information.

*Researchers at **Baylor University** are interested in exploring body weight of Baylor students and determining factors related with weight during the first year of college in comparison to weight during non-first years of college (e.g., the 2nd or 3rd year of college, etc…). The research findings from this project will be used to help inform the development of future health promotion strategies for students at Baylor University. This class has been selected to participate in this project that consists of a Health Survey and Height and Weight measurements.*

*Please know that your **participation is voluntary.** If you choose not to take part in the study, there will not be a penalty. The first page is an Informed Consent Form explaining your rights as a participant, the details of the study, the risks and benefits of participating in the study, and contact information. If you would like a copy of the Informed Consent Form to take home we have one available for you. The survey and health measurements should not take the entire time allotted for class. If you choose to participate in the study you will fill out the Informed Consent Form first and then follow the instructions for each section of the Health Survey. When you have completed the survey you will go to the designated privacy location for the height and weight measurements and then return to the class and give your survey packet to the proctor. You will turn to the last page of the packet, fill in your birthday, and bring it with you to get your measures recorded. Be sure to also bring your writing utensil with you. If you would like to know your height and weight measurements bring a piece of paper and writing utensil with you when you go receive your measurements.*

***Do not disassemble the health survey packet at any time during the study unless directed otherwise by the proctor**. In order to successfully complete the survey please be*

mindful of the format, it is double-sided and has multiple question boxes on every page. If you have any inquiries about any of the questions on the survey, I can help clarify the context of the questions but I cannot provide you with answers. You may now begin by filling out the Informed Consent Form first and then complete the attached survey. After you have completed the Informed Consent Form remove it from the stapled packet and pass it to the front of the class. Print your name and email clearly on the Informed Consent Form.

Do you have any questions about the information I have just provided about the project?

[At this point if anyone raises their hand or chooses not to participate say the following (if no one says anything omit this last comment):]

If you have chosen not to participate in the study you are permitted to work on your Behavior Enhancement Project assignment or work on other HED 1145 related homework as you wait. As stated in the class syllabus you may not use any electronic devices, cell phones, or work on assignments for another class. If you have chosen not to participate in the study please pass your packet to the front of the class so I may collect them from you.

Thank you and you may now begin.

While the participants are completing the survey

1. If participants have questions about any of the questions, you may help them interpret the meaning.
2. Observe those participating to ensure that they do not skip any questions, as the survey is double-sided.
3. Direct the participants to the designated height and weight measurement location and remind them to bring their packet with them, turned to the last page.
4. Monitor those who have decided not to participate to ensure they have proper class conduct.
5. If you have any emergency questions or concerns please refer to the contact person listed for your class time in the attached document. You can always call Kimber at 210-385-9182 if needed.

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