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Weight Change in College Freshmen: Personal, Interpersonal and Situational Influences

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**WEIGHT CHANGE IN COLLEGE FRESHMEN:
PERSONAL, INTERPERSONAL AND SITUATIONAL
INFLUENCES**

by

KRISTIN L. KUHLMANN

B.S., Nursing, University of Arizona, 1990
M.S., Nursing, Arizona State Universtiy, 1995

DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**Doctor of Philosophy
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DEDICATION

To my husband, Bob Harrell, who never doubted I could achieve this goal, and who put up with missed meals, frayed nerves, cancelled plans, and occasional tears of frustration. My path would have been very different these past 34+ years without your love and support.

In honor of my late parents, Arnold and Donna Roberts Kuhlmann, who instilled in their children the belief that continual learning is the highest mission on this life's journey.

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ABSTRACT

Obesity has become the most significant noninfectious health risk in the United States, and the major causes of death and disability are shifting to chronic, non-communicable health conditions that are largely attributable to physical inactivity, overweight and obesity, and other diet-related factors. Among children and adolescents, the overweight/obesity rate is approaching 32%, with 17.9% of adolescents becoming obese. While the obesity rate has doubled in all age groups in the United States, it has tripled among young adults aged 18 to 28 years, and 70% of adolescents who are at a healthy weight will become overweight or obese as adults. At particular risk for rapid weight gain are college freshmen; the rate of weight gain in the first semester of college is twice that of same-age peers, and 77% of all college freshmen gain weight. The purpose of this descriptive study was to explore the personal, interpersonal, and situational factors that influenced weight change in freshmen. Seventy-six college freshman completed measures of demographics, height and weight, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management,

interpersonal relations, spiritual growth, and health responsibility at baseline and 15 weeks later during their first semester of college. Participants gained a mean of 2.3 pounds, with 43% gaining clinically significant weight ($\geq$ 3.5 pounds); 33% of the participants gained over five pounds. Two variables predicted 12% of this weight gain: a low level of health responsibility and having an underweight/normal BMI upon entrance to college. Identification of participants in the underweight/normal BMI category as the group at most risk for significant weight gain was an unexpected finding that merits further exploration. In addition, findings indicate that strategies are needed to create stronger support systems, to increase the level of health responsibility, and to encourage college freshmen to regularly perform behaviors to attain, or maintain, a healthy weight throughout the first year of college.

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CHAPTER 1

INTRODUCTION

Today, 65% of the world's populations live in countries where overweight and obesity are responsible for more deaths than malnutrition. As life expectancies increase globally, the major causes of death and disability are shifting to chronic, noncommunicable health conditions that are largely attributable to physical inactivity, overweight and obesity, and other diet-related factors (World Health Organization [WHO], 2013). In the United States, obesity has become the most significant noninfectious health risk, and because of the rapid rise in prevalence, some health leaders now refer to it as an epidemic (Pereira et al., 2005; WHO, 2013).

In the U.S., 35% of adults are obese, with an additional 33% being overweight. Among children and adolescents aged 2 to 19 years, the overweight/obesity rate is approaching 32% , with 17.9% of adolescents, aged 12-19, being obese (Flegal, Carroll, Ogden, & Curtin, 2010; HealthyPeople.gov, 2012; Kumanyika, Parker, & Sim, 2010; Trust for America's Health, 2012).

Obesity in Adolescents and Young Adults

Although the obesity rate has doubled in all age groups in the United States in the past 25 years, it has tripled among young adults aged 18 to 28 years (Harris, Perreira, & Lee, 2009; Trust for America's Health, 2012). Whereas 80% to 90% of adolescents who are overweight or obese become obese adults, up to 70% of adolescents who are not overweight will also become overweight or obese as adults (Crossman, Sullivan, &

Benin, 2006; Cruz & Goran, 2004; Flegal et al., 2010; Gordon-Larsen, The, & Adair, 2010; Harris et al., 2009; Ogden, Carroll, & Flegal, 2008).

This rapid increase of obesity in all Americans indicates that the etiology of obesity is complex, multifactorial, and cannot be attributed to biological and genetic factors alone. Physiology plays a role in obesity, but the sharp increase in obesity over the past quarter-century demonstrates that other environmental factors are involved (Boone-Heinonen, Gordon-Larsen, & Adair, 2008). Additionally, although health experts may be able to predict the risk of becoming overweight or obese into young adulthood for some adolescents, it is even more difficult to identify the personal, interpersonal, and situational determinants that are the most influential in this weight gain.

The largest longitudinal study on adolescents and young adults conducted to date is the National Longitudinal Study of Adolescent Health Survey (the Add Health Survey). Beginning with school-aged adolescents in 1999, the study was designed to examine how the psychosocial and cultural environment (including families, friends, schools, neighborhoods, and communities) influences adolescent health and risk behaviors over time (National Institute of Child Health and Human Development, 2007). One of the factors examined was risk of obesity. In 2001-2002, interviews and height/weight measures were obtained on more than 15,000 of the original participants; these measures were obtained again at ages 18 to 28 years of age. Using growth curve modeling, it was found that a startling 70% of the cohort would be overweight or obese by age 25, with the most rapid increase in weight gain occurring when young adults left home and began independent lives (Harris et al., 2009).

These and similar findings indicate that there are environmental factors that encourage adolescents and young adults to gain weight (Crossman et al., 2006; Cruz & Goran, 2004; Flegal et al., 2010, Gordon-Larsen et al., 2010; Harris et al., 2009; Ogden et al., 2008). The term "obesogenic" has been used in recent literature to describe the pervasive environmental factors that promote unhealthy and rapid weight gain (Swinburn & Egger, 2002; Trust for America's Health, 2012). Swinburn, Egger and Raza (1999) defined the obesogenic environment as "the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations" (p. 564). In a similar manner, the Institute of Medicine has defined the environmental influences that can lead to obesity as "people's cultural, socioeconomic, and physical contexts" (Kumanyika et al., 2010, p. 17).

Two overarching environmental factors have been identified as contributing to adolescent overweight/obesity in the United States, including increased consumption of energy-dense foods and reduced total energy expenditure (physical activity). The widespread availability of inexpensive "fast" food and energy-dense snacks and beverages, often offered in large portion sizes, are ubiquitous in current American culture (Hill, Wyatt, Reed, & Peters, 2003).

At the same time, adolescents have lower intakes of the dietary fiber, fruit, and vegetables that are required to meet nutritional needs. In conjunction with an increase in food intake, an overall reduction in physical education (PE) programs in public schools and increased time spent in sedentary behaviors, such as watching television and playing video and computer games contribute to the risk of obesity. In several studies, it was also noted that adolescents begin to demonstrate reduced time spent in physical activity as

they approach adulthood (Gordon-Larsen, Nelson, & Popkin, 2004; Gordon-Larsen et al., 2010; Hill et al., 2003; Sebastian, Ennis, & Goldman, 2009; Wengreen & Moncur, 2009).

According to findings from the Add Health Survey (Gordon-Larsen, McMurray, & Popkin, 2000), physical activity levels in adolescents were found to be impacted by environmental factors within the built environment (i.e., availability of PE programs and community recreation centers) and level of neighborhood crime. High socioeconomic status (SES) and low-minority neighborhoods were significantly more likely to have activity-related resources, compared with lower SES and high-minority neighborhoods. Sociodemographic factors (i.e., income status and place of residence) also were shown to have more influence on the level of sedentary activities. In this study, adolescents and young adults with lower SES and who lived in more crime-ridden areas engaged in higher levels of sedentary behavior than did those with higher SES who lived in safer neighborhoods.

In this same cohort of adolescents from the Add study, differences in levels of body mass index (BMI) categories (overweight/obesity levels) also differed based on race/ethnicity, gender, and SES, particularly for female adolescents (Gordon-Larsen, Adair, & Popkin, 2003). Obesity risk was reduced for White, Hispanic, and Asian female teens with high SES; however, for Black, non-Hispanic females, the risk of obesity actually increased with higher SES levels. For males, obesity risk disparities were lowest at average SES levels. Overall, there were no significant differences in BMI, based on race and ethnicity in male adolescents.

In conclusion, these findings demonstrate that although there are personal, interpersonal, and situational factors that have been identified as contributing to obesity,

there are still many environmental influences on weight gain during the transition into young adulthood that require investigation. This precipitous rise in obesity rates in 18- to 28-year-olds has spurred a renewed interest over the past decade in studying the weight gain experienced by college students, specifically the purported "freshman 15" (Brown, 2008).

The Freshman 15

The threat of rapid weight gain in the first year of college has been christened the freshman 15 and serves as a cautionary tale about the number of pounds typically gained by first-year college students. The roots of this term come from a 1985 seminal study that demonstrated that the average college freshman female student gained 0.73 pounds per month, with freshmen women 2.6 to 5.2 times more likely to gain 15% above ideal body weight, compared with same aged women who did not attend college (Hovell, Mewborn, Randle, & Fowler-Johnson, 1985). Shortly thereafter, articles citing findings of an average 15-pound weight gain began to appear in popular magazines, newspapers, and college publications.

To determine the actual weight gain experienced by college freshmen, however, Brown (2008) performed an extensive database review of U.S. freshman weight gain. The meta-analysis revealed that in 14 studies ($N = 1,858$), students gained an average of 4.6 pounds over the first year of college, with mean weight gain, per study, ranging from 2.4 to 8.8 pounds. Other studies have shown similar results, with 3.3 to 7.8 pounds gained in the first year of college (Cluskey & Grobe, 2009; Gillen & Lefkowitz, 2011; Gropper et al., 2009; Lloyd-Richardson, Bailey, Fava, Wing, & the Tobacco Etiology Research

Network (TERN), 2009; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005; Wengreen & Moncur, 2009).

In addition, the rate of weight gain in the first semester has been found to be twice that of same-age peers, compared with large representative groups of older adolescents not attending college (Levitsky, Halbmaier, & Mrdjenovic, 2004; Mokdad et al., 2003). Lloyd-Richardson et al. (2009) found that, overall, 77% of college freshmen gained weight in the first year, with 67% of the weight gained in the first semester.

BMI, a ratio calculated from a person's height and weight, has been developed as a standard screening measure to identify persons at risk for morbidity and premature mortality due to obesity (Janssen et al., 2005; Reilly et al., 2003). Lloyd-Richardson et al. (2009) found that the mean increase in BMI for freshmen was 1.5 kg/m² for both genders, with an increase in overweight/obesity from 21.6% to 36% over the first year of college. Only 10% of students maintained their weight within a 2-pound range, and only 6% experienced weight loss.

Additionally, two recent studies have demonstrated that weight gain continues past the first year of college. The increase in obesity and the establishment of lifestyle routines conducive to weight gain continue throughout college and after college graduation. Lloyd-Richardson et al. (2009) found that by the end of the sophomore year, females had gained an average of 9.2 pounds overall and males gained an average of 9.5 pounds. In a study following college students throughout the entire undergraduate experience (Nelson, Gortmaker, Subramanian, Cheung, & Wechsler, 2007), the prevalence of overweight/obesity for students under 25 years old increased from 29.9% in college freshmen to 34.6% by the fourth year of college. These findings coincide

closely with those of the National College Health Risk Behavior Survey (American College Health Association, 2012), which revealed that 30% of male college students and 37% of female students report being overweight or obese.

Furthermore, weight gain continues when students leave college. For example, in a 10-year longitudinal study of young adults, higher rates of obesity were experienced by participants who had attended college when compared with those who had not (Flegal et al., 2010). This is a relatively new finding. Although obesity rates are still higher in women with lower levels of education and income overall, there is now a higher obesity rate observed in men with higher educational attainment and SES (Ogden, Lamb, Carroll, & Flegal, 2010).

In conclusion, although the average weight gain of college freshmen is less than the professed freshman 15, there remains a considerable reason for concern. Currently, a higher number of entering college freshmen are overweight or obese compared with prior generations, and college attendance has been shown to accelerate the amount of weight gain (Brown, 2008; Gordon-Larsen et al., 2010; Ogden et al., 2008).

U. S. college freshmen are at the threshold of a three-fold increase in overweight/obesity as they enter young adulthood. Additionally, college freshmen gain weight at double the rate of same-age adolescents not attending college. These findings indicate that there are personal, interpersonal, and situational influences that place freshman college students at an increased risk for rapid weight gain (Gillen & Lefkowitz, 2011; Gordon-Larsen, Nelson et al., 2004; Harris et al., 2009; Levitsky et al., 2004; Mokdad et al., 2003; Ogden et al., 2006). More study is necessary, therefore, to develop a better understanding of factors that contribute to this phenomenon. In this study,

environmental influences encountered by college students that may play a part in rapid weight gain were explored.

<div align="center">**Weight Change in College Freshmen**</div>

Integration of the Health Promotion Model

The Health Promotion Model (HPM) was the theoretical framework selected for this study (Pender, Murdaugh, & Parsons, 2006) because it is likely that the university environment influences college students' personal, interpersonal, and situational states, and these factors affect behavioral decision making related to weight maintenance. According to the HPM, health behavior determinants are influenced by three major constructs: *individual characteristics and experiences (personal factors)*, *situational and interpersonal influences,* and *behavior-specific cognitions and affect* (Pender et al., 2006). These determinants can have either a negative or positive influence on health-promoting behaviors through ongoing interaction within the environment. The assumptions of the HPM clearly describe the relationship between the person and the environment in establishing health-promoting behavior (Pender, 2006):

1. Individuals interact with the interpersonal, psychosocial, and cultural environment and, as a result, progressively transform the environment, while being transformed.

2. Self-initiated behavioral change is achieved through modification in person–environment interactions.

3. Individuals value growth, actively seeking to regulate their own behavior in a positive direction, while maintaining a balance between change and stability.

Within this study, the focus was on the personal, interpersonal, and situational components of Pender's model, rather than cognitions and affect. Factors identified in prior studies as contributing to freshman weight gain were examined in this study.

Purpose of the Study

In this descriptive study, the purpose was to explore the personal, interpersonal, and situational factors that result in the dependent variable, *weight change* in freshmen in the first semester of college. Independent variables included *BMI category, height, gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth,* and *health responsibility.* Weight change from Time 1 (T1) to Time 2 (T2; 15 weeks' duration) was examined to determine whether the weight change in participants was statistically and clinically significant over the first semester of college.

Conceptual Definitions of Variables

The conceptual definitions for the variables in this study were as follows:

1. *Weight change* was the amount of change in weight (in pounds) between T1 and T2.

2. *BMI* was determined by using the *BMI percentile calculator for child and teen* (Centers for Disease Control and Prevention [CDC], 2011). These specific age and gender percentile charts were also used to determine the BMI category, because the amount of body fat changes during different stages of adolescence, and the amount of body fat is different for males and females. Numerous studies have demonstrated that a high BMI measure assists in identifying high body fat content, with associated increased risk of morbidity

related to obesity (Reilly, 2006). BMI percentile charts utilizing national reference data and adjusted for age and gender in adolescents are "adequate for most purposes in clinical practice, public health, and research" (Reilly, 2006, p. 597).

3. *BMI category* was determined, based on the BMI obtained for each participant: underweight = < 18.5 kg/m^2; normal = 18.5–24.99 kg/m^2; overweight = 25.0–29.99 kg/m^2; and obese ≥ 30.0 kg/m^2.

4. *Height change* was the amount of change in height (in inches) between T1 and T2.

5. *Gender* was self-identified and designated by the dichotomous choice of either *male* or *female*.

6. *Race* was self-identified, and choices included *American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander*, *White,* and *Other* (University of New Mexico [UNM], n.d.).

7. *Ethnicity* was self-identified as *Hispanic* or *non-Hispanic* (UNM, n.d.).

8. *Physical activity* was defined as the degree of participation in light, moderate, and/or vigorous activity, either planned or incidental to daily life and leisure activities (CDC, 2012; Walker & Hill-Polerecky, 1996).

9. *Sedentary behavior* included activities that were performed in a sitting or lying position and required little physical activity. Examples of activities included watching television, playing video games, surfing the web, performing homework, reading, or studying (Utter, Neumark-Sztainer, Jeffrey, & Story, 2003).

10. *Nutritional intake* relates to the consumption of a daily diet, based on the guidelines of the U.S. Department of Agriculture's (USDA, 2013) dietary guidelines for Americans and the recent "My Plate" campaign.

11. *Beverage and snack intake* addressed foods higher in caloric content and lower in nutritive value. Healthier snacks (fresh fruits and vegetables) and beverages (water and milk) were compared with snack and beverages that have high fat and sugar content and low fiber content and nutritive value (Neuhouser, Lilley, Lund, & Johnson, 2009).

12. *Alcohol intake* related to the number of alcoholic beverages consumed on each occasion and the frequency of intake of alcoholic beverages (beer, wine, liquor, or spirits; Nelson, Lust, Story, & Ehlinger, 2009; Engs, 2007). Frequency of alcohol intake ranged from daily to less than once a year (or never).

13. *Stress management* related to the use of psychological and physical resources that might be used to control stress and tension, including common coping strategies and stress-reducing activities (Pender et al., 2006; Walker & Hill-Polerecky, 1996)

14. *Interpersonal relations* included the use of communication (both verbal and nonverbal) with other people in an attempt to achieve a sense of intimacy or psychosocial closeness (Walker & Hill-Polerecky, 1996; Walker, Sechrist, & Pender, 1995).

15. *Spiritual growth* focused on the development of the inner resources of "transcending, growing, and connecting" (Walker & Hill-Polerecky, 1996, p. 1) to maximize the potential for wellness, and to work toward purposeful goals relating to a healthy lifestyle (Pender et al., 2006).

16. *Health responsibility* involved an active sense of accountability for one's own health through education, health actions, and following recommendations of health professionals to improve health (Walker & Hill-Polerecky, 1996; Callaghan, 2003).

Specific Aims

To explore the personal, interpersonal, and situational factors within the college environment that may increase the risk of weight gain in college freshmen, the specific aims for this study were to:

1. Determine whether college freshmen experienced significant weight change in the first semester of college.

2. Examine the effects of gender, ethnicity, and race on weight change in college freshmen during the first semester of college, after controlling for baseline BMI and any change in height.

3. Assess the additional predictive value of BMI category, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility on weight change in college freshmen in the first semester of college.

Research Questions

For this study, the following research questions were constructed. In the first semester of college:

1. Was there significant weight change in the first semester of college?

2. What were the effects of gender, ethnicity, and race on weight change in the first semester college freshmen after controlling for their baseline (T1) BMI category and any change in height from T1 to T2?

3. Did self-reported physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility predict first-semester freshman weight change after accounting for baseline BMI category, height change, gender, ethnicity, and race?

Hypothesis

It was also hypothesized that weight change over the first semester of college was associated with higher levels of sedentary behavior, beverage and snack intake, and alcohol consumption and lower levels of physical activity, good nutritional intake, stress management, interpersonal relations, spiritual growth, and health responsibility.

Summary and Conclusions

Prior research has demonstrated that college freshmen gain weight at double the rate of same-age peers, with weight gain occurring in the range of 2.6 to 9.5 pounds in the first year of college. Weight gain occurs in up to 75% of all students assessed (Brown, 2008; Clusky & Grove, 2009; Gillen & Lefkowitz, 2011; Gordon-Larsen, Adair, Nelson,

& Popkin, 2004; Gropper et al., 2009; Harris et al., 2009; Levitsky et al., 2004; Lloyd-Richardson et al., 2009; Racette et al., 2005; Wengreen & Moncur, 2009). This weight gain may result in a shift into the overweight/obese category, which results in increased health risk, particularly related to cardiovascular and metabolic disorders. Unfortunately, this generation of college graduates may be part of a generation who will die at an earlier age than their parents due to the emerging obesity "epidemic" and earlier onset of chronic health problems associated with this condition (HealthyPeople.gov, 2012; Lloyd-Jones et al., 2007; National Heart, Lung, and Blood Institute, 2010; Olshansky et al., 2005; WHO, 2013).

College is a critical juncture at which to assess the specific risks that lead to an acceleration in student weight gain, compared with same-age peers. Although there has been an increased interest in recent research to determine the amount of weight gained by college students, far less emphasis has been place on the underlying reasons that college students gain weight at twice the rate of same-age peers (Levitsky et al., 2004; Mokdad et al., 2003). Further research is necessary, therefore, to identify factors that may place college students at higher risk for obesity. The HPM (Pender, 2002; Pender et al. 2006) was used as the theoretical framework for this study to determine the effects of personal, interpersonal, and situational characteristics on weight gain in college freshmen.

If specific risk factors for rapid weight gain are identified, targeted health promotion education can be provided to college freshmen based on research findings. The creation of long-term health-promoting behaviors may ameliorate obesity, and related chronic health problems, into adulthood (HealthyPeople.gov, 2012; Scharoun-Lee, Adair, Kaufman, & Gordon-Larsen, 2009). An extensive literature review was

conducted to describe the developmental state of emerging adulthood and the lifestyle risks inherent in this process as they relate to weight gain. The state of the science, as it relates to personal, interpersonal, and situational factors associated with rapid weight gain in college students, and the constructs of the HPM that provide the framework for the study design are described in Chapter 2.

CHAPTER 2

LITERATURE REVIEW

This chapter presents an extensive literature review that describes emerging adulthood, the lifestyle risks inherent within this developmental stage, and how associated lifestyle behaviors may relate to weight gain in college freshmen. The health risks related to obesity are discussed, as well as the importance of identifying health-promoting behaviors that can reduce or ameliorate medical conditions associated with obesity. Next, the constructs of the HPM that provide the framework for the study design are introduced (Pender et al., 2006), with the personal, interpersonal, and situational factors that increase obesity health risks specifically for college freshmen. These factors include BMI category, height, gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility.

Emerging Adulthood

Adolescence is a period marked by rapid physical and psychosocial changes. For students entering college, the transitional stage between childhood and adulthood is even more pronounced as they begin to make independent decisions about all aspects of their daily lives. According to the developmental period of emerging adulthood (Tanner & Arnett, 2009), two major factors influence health status- the transition from adolescence to adulthood, and the weakening of the safety net supported by parents and other adults that was present during childhood and earlier adolescence (Park, Mylve, Adams, Brandis, & Irwin, 2006). Freshmen have little experience in taking on health responsibility, and commitment to actions are often inconsistent and transitory in nature.

Admission to a postsecondary institution engenders important developmental transitions within a new environment. Important milestones include leaving home and increasing autonomy in decision making, gaining a new perspective on life issues, changing social support systems, developing new interpersonal relationships, developing new health habits and routines, and performing well academically, all with little external guidance (Mahat, Scoloveno, & Whalen, 2002; Nelson et al., 2007; Nelson, Story, Larson, Newmark-Sztainer, & Lytle, 2008; Scharoun-Lee, Kaufman, Popkin, & Gordon-Larsen 2009).

Research has indicated that weight gain accelerates at the most rapid rate during this stage of *emerging adulthood*, as older adolescents strike out on their own and begin to move from the strong influence of parents and family (Arnett, 2007a; Arnett, 2007b; Flegal et. al, 2010; Harris et. al, 2009; Park et al., 2006; Tanner & Arnett, 2009). College admission doubles the risk of rapid weight gain for entering freshmen compared with same-age peers, with three-quarters of the weight gained within the first semester of college (Cluskey & Grobe, 2009; Gropper et al., 2009; Levitsky et al., 2004; Lloyd-Richardson et al., 2009; Mokdad et al., 2003; Racette et. al, 2005; Wengreen & Moncur, 2009). A rapid rise in obesity can lead to both short-term and long-term medical conditions; therefore, the health risks associated with obesity are briefly reviewed.

Obesity and Health Consequences

The health risks associated with obesity in adolescence and young adulthood have both short-term and long-term consequences. In addition to the health risks associated with metabolic syndrome (hypertension, cardiovascular disease, diabetes), there is also increased risk for other medical conditions, including asthma, steatohepatitis (fatty

infiltration and inflammation of the liver), and sleep apnea. Polycystic ovarian syndrome is more common in obese females and can cause abnormal body hair (hirsutism), acne, menstrual irregularity, and infertility (Huang et al., 2005; Polycystic Ovarian Syndrome Association, 2009).

Metabolic syndrome is rare in college students, occurring at a rate of 0.6% to 3.3%; however, diagnosis of at least one metabolic component is common, with rates ranging from 27% to 53% (Burke, Reilly, Morrell, & Lofgren, 2009; Huang et al., 2004; Huang, Shimel, Lee, Delancey, & Strother, 2007). Hyperlipidemia, with reduced levels of the protective high-density lipoproteins, and hypertension are the two most common medical conditions found in college students. Although the incidence of metabolic syndrome indicators vary widely in college students, they demonstrate substantial risk in contracting metabolic syndrome, with obese students at highest risk for developing cardiovascular disease and diabetes (Burke et al., 2009; Carnethon et al., 2004; Huang et al., 2007; Sacheck, Kuder, & Economos, 2010). Huang et al. (2004) calculated that overweight college students have three times the risk of developing at least one component of metabolic syndrome, compared with normal weight students.

Clinically Significant Weight Gain

Research indicates that maintenance of BMI or modest weight loss (5%-10% of total body weight), coupled with improvement in physical activity, decreases the risk of developing metabolic syndrome (Burke et al., 2009; Cruz & Goran, 2004). Fortunately, lifestyle changes, such as healthy nutritional intake combined with regular physical activity, improve health status; a 5% to 10% decrease in BMI in obese adolescents has demonstrated a significant reduction in cardiovascular risk indicators (hypertension and

dyslipidemia) and insulin resistance (Esposito, Ceriello, & Guigliano, 2007; Khan, Rieder, Cohen, Coupey, & Wildman, 2010).

Conversely, there is no current consensus on what defines significant weight gain that increases the health risk for any specific population, and there are varying opinions on how to obtain the best epidemiologic measure (Stevens, Truesdale, McClain, & Cia, 2006; Truesdale et al., 2006). First, to be useful for this study, the definition of clinically significant weight gain must exclude normal day-to-day weight fluctuations based on factors such as indoor clothing variance due to season, diurnal fluid balance, menstruation cycle fluctuations for female participants, consideration of differences in body size and fat distribution based on gender, baseline BMI, measurement error, and lean/fat body composition among participants (e.g., atheletes versus sedentary participants).

Stevens, McClain, and Truesdale (2008) calculated an absolute weight change of less than 3 pounds, or 1.5% weight fluctuation, to represent a normal, steady annual weight state in young adults. Levitsky et al. (2004) reported that the expected weight gain in 17- to 18-year-olds, based on a linear regression model from multiple studies, is approximately 15 g/week. Since the current study is over a 15-week span, the expected weight gain would be approximately 225 grams, or 0.495 pounds. Therefore, a positive mean weight change of 3.5 or more pounds between T1 and T2 would indicate clinically significant weight gain within this study cohort. In two previous research studies relating to college freshman weight change, Levitsky et al. (2004) found a 4.2-pound mean weight increase in the first 12 weeks of the freshmen semester ($N = 60$), whereas Lloyd-

Richardson et al. (2009) found a mean weight gain over the fall freshman semester of 7.0 pounds for males and 7.5 pounds for females ($N = 588$).

In summary, it is important to identify factors that increase the risk of significant weight gain in college freshmen and to improve health-promoting behaviors to reduce the risk of chronic disease. Reducing the risk of obesity through preventive and ameliorative measures can increase life expectancy by 5 to 20 years and reduce morbidity throughout adulthood (HealthyPeople.gov; 2012; Lloyd-Jones, et al., 2007; National Heart, Lung, and Blood Institute, 2010; Olshansky et al., 2005; WHO, 2013). Therefore, the personal, interpersonal, and situational factors that influence the health-related behaviors of college freshmen that increased weight significantly were explored in this study to determine whether clinically significant weight gain was detected (mean weight gain of ≥ 3.5 pounds).

Theoretical Framework: The HPM

The sudden increase in weight gain for college freshmen indicates that there are obesogenic factors contributing to this sharp rise for students living in the university environment (Swinburn & Egger, 2002; Swinburn et al., 1999). The HPM provides an excellent framework to identify factors leading to obesity and weight gain because the assumptions of the model clearly describe the relationship between the person and the environment (Pender et al., 2006). HPM constructs that may prove useful in exploring the phenomenon of freshman weight gain and increase in BMI, with integration of the unique influences present in emerging adulthood, were explored. Within this examination, a comprehensive review of the personal, interpersonal, and situational influences that may place college freshmen at risk for rapid weight gain was undertaken.

Decreasing health risk behaviors and increasing activities that improve well-being are the major objectives of health promotion behaviors. The HPM depicts the multidimensional interactions among constructs of the personal, interpersonal, and situational influences within the environment that affect the ability to consistently perform healthy behavior (Figure 1). A significant strength of the HPM is the concentrated effort to address the attainment of *health-promoting behaviors* within the environmental context (Pender et al., 2006).
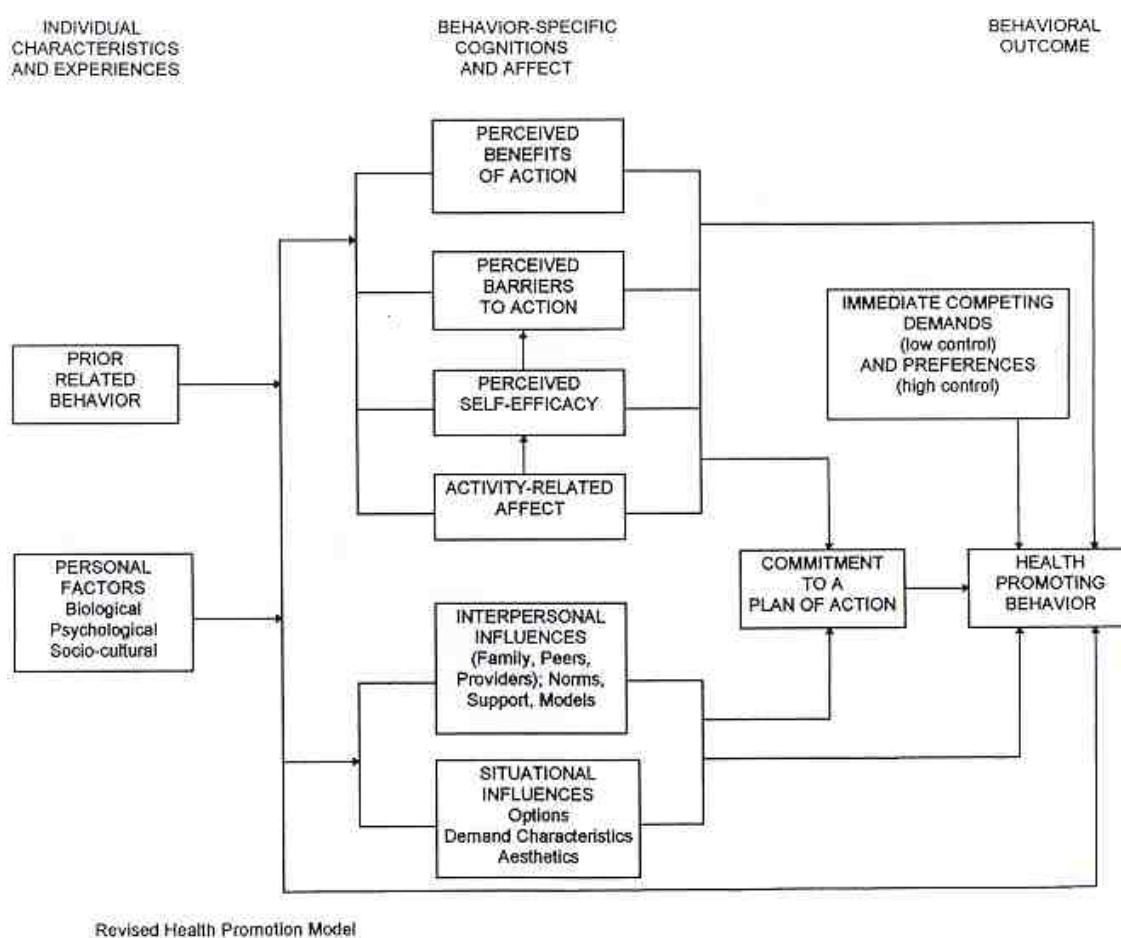
Figure 1. Health Promotion Model. From *Health Promotion in Nursing Practice* (5th ed.), by N. J. Pender, C. L. Murdaugh, and M. A. Parsons, 2006, Upper Saddle River, NJ: Pearson Prentice Hall, p. 50. Copyright 1996 by Nola J. Pender.

According to the HPM model (Pender et al., 2006), successful health-promoting behavior is influenced by *prior related behaviors* and biopsychosocial and cultural *personal factors*. Individuals *commit to a plan of action* based on *perceived benefits, barriers,* and *self-efficacy* (perceived competence) to establish or continue a health-promoting behavior. *Interpersonal influences* (family, peers, support system, and sociocultural norms) and *situational influences* (environmental cues that trigger specific actions and available options) also frame part of the environmental context that can either impede or facilitate health-promoting behavior.

C*ompeting demands* may reduce the *commitment to a plan of care,* particularly when demands are immediate and pervasive. However, if health actions are attractive and embraced by the individual (*preferences*), commitment to a health promotion plan is strengthened (Pender et al., 2006).

Whereas interpersonal and situational influences within the environment can either increase or decrease commitment to a plan of action, perceived barriers to action reduce the commitment to perform the behavior (Pender et al., 2006). *Personal factors* included in the study were BMI category, height, gender, and race and ethnicity, whereas *interpersonal and situational* variables included physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol intake, stress management, interpersonal relations, spiritual growth, and health responsibility.

In the following sections, the literature is reviewed for each study variable, examining what is known about relationships among the variables and the influence each may have, individually and collectively, on weight gain in college freshman.

Individual Characteristics and Experiences

Although prior related behaviors were not specifically addressed in this study, the attitudes, beliefs, and values regarding health-promoting behaviors at the societal, cultural, community, and familial levels have a significant influence on future healthy lifestyle practices. For example, food choice is closely associated with familial traditions. Because of its innate ability to provide sustenance and satiety, food plays a major role in sociocultural rituals in all ethnic/racial populations (Fiese et al., 2002). In addition, prior family involvement in activities such as biking, skating, hiking, and camping encourages physical activity, whereas more sedentary routines, such as watching television or playing video games, have the opposite effect. Being active in sports, team events, and student organizations also supports regular physical activity into young adulthood (Lake, Townshend, Alvanides, Stamps, & Adamson, 2009).

Although prior related behaviors were not included in this study, the personal variables that were considered included BMI category, height, gender, and race and ethnicity. Former studies on older adolescents and college students have demonstrated that these characteristics may influence weight gain and BMI change within the first year of college (Gordon-Larsen, Adair et al., 2004; Harris et al., 2009).

Body Mass Index

Adolescents raised in households with unhealthy eating practices and inactive lifestyles are 33% more likely to be overweight or obese as young adults (Zeller et al., 2007). Crossman et al. (2006) found that adolescents who were allowed to skip breakfast, ate whatever they wanted without set mealtimes, and spent unlimited time on sedentary activities were more likely to be overweight or obese into young adulthood, with the

likelihood increasing to 68% for males and 32% for females. Furthermore, 70% to 80% of adolescents who are overweight or obese will become obese in adulthood (Cruz & Goran, 2004; Gordon-Larsen et al., 2010; Ogden et al., 2008).

Therefore, prior weight-related behavior may well have an effect on the initial BMI at T1. Change in BMI and weight between T1 and T2, and the difference in health-related behavior states reported between T1 and T2, reflect how health-related behaviors change over time, within the context of the university setting. For example, entering college students who snack more frequently, do not exercise regularly, and engage in many hours of sedentary behavior are at higher risk for overweight or obesity (Desai, Miller, Staples, & Bravender, 2008; Furia, Lee, Strother, & Huang, 2009). In addition, Brunt, Rhee, and Zhong (2008) found that overweight and obese college students ate significantly more saturated fats and fewer fruits and vegetables than their normal-weight peers.

Only one study tracked BMI at the beginning of the freshman year of college and how it changed over time. In this study, Gropper et al. (2009) did not find a significant difference in BMI change or weight gained based solely on BMI category. However, longitudinal studies have shown significant changes in BMI for college freshmen. For example, Racette et al. (2005) found that 75% of freshmen experienced a significant increase in BMI over the first year of college, whereas Lloyd-Richardson et al. (2009) found that overweight/obesity rates increased from 22% to 36% over the freshmen and sophomore years of college. In the current study, a change in BMI and BMI category was explored, along with the observation of whether there was a clinically significant increase in weight.

Gender

Researchers have conducted analyses to determine whether there are differences in college weight gain between males and females. Adolescent males generally have higher BMIs than women, because they are taller and have more muscle mass. However, study results have been inconsistent and contradictory when assessing change in overweight/obesity BMI category in older adolescents, when based solely on gender. Although some studies found that males had a higher increase in weight gain than women (Cluskey & Grobe, 2009; Gropper et al., 2009; Lloyd-Richardson et al., 2009; Nelson et al., 2007; Racette et al., 2005), other studies found no difference between male and female college students (DeBate, Topping, & Sargent, 2001; Economos, Hildebrandt, & Hyatt, 2008; Hoffman, Policastro, Quick, & Lee, 2006). Therefore, the characteristic of gender was included in this study to determine whether there was a difference in weight gain and the increase in BMI between male and female college freshmen.

Race/Ethnicity

In two large longitudinal studies of older adolescents, there were no differences noted in the rate of weight gain or increased BMI based on race and ethnicity (Gordon-Larson, Adair et al., 2004; Ogden et al., 2008). Three studies with college freshmen also found no difference in the amount of weight gain or BMI change (DeBate et al., 2001; Gropper et al., 2009; Hoffman et al., 2006).

However, a study by Nelson et al. (2007) indicated that college weight gain varies significantly across racial/ethnic groups. In males, an increase in BMI was more prevalent among Blacks/African Americans and Hispanics, and Black/African American females had significantly increased BMIs compared with other female college students.

Overall rates of overweight and obesity for college students according to race/ethnicity were as follows: Blacks/African Americans, 38.3% overweight and 19.2% obese; Native Americans, 30.6% overweight and 10.3% obese; Hispanics, 30.2% overweight and 10.5% obese; White non-Hispanics, 26.7% overweight and 7.9% obese; and Asians/Pacific Islanders, 16.4% overweight and 2.9% obese. The factor of race/ethnicity was also examined in this study to determine whether significant differences were found in the initial BMI, amount of weight gained, and change in BMI, based on race/ethnicity.

Physical Activity

Physical activity is a well-known predictor of BMI; there is an inverse relationship between weight gain and consistent physical activity. Wengreen and Moncur (2009) reported that a substantial number of college freshmen (41% to 61%) stated that they participated in less physical activity in the first semester of college compared with high school. Although there was no significant increase in total caloric intake or fast food intake in the first semester of college, the average weight gain in participants was 3.3 pounds, with 23% gaining 5% or more of their original body weight.

The recommended amount of exercise for adolescents is 60 minutes of moderate-to-vigorous physical activity (MVPA) daily. The National College Health Assessment (American College Health Association [ACHA], 2012) revealed that only 31.5% of college students performed moderate exercise 30 minutes/day or vigorous exercise 20 minutes/day at least 5 days/week, with 8.9% stating they performed stretching or muscle-toning activities at least 5 days/week. In a meta-analysis of physical activity in college students, 40% to 50% reported being physically inactive (Keating, Guan, Pinero, & Bridges, 2005). In a related study, Economos et al. (2008) found that, overall, freshmen

men exercised more often than freshmen women (3.84 days/week vs. 3.10 days/week, respectively) and for a significantly longer duration/episode (62 minutes vs. 37 minutes, respectively). McArthur and Raedeke (2009) found that only half of college students were physically active for a minimum of 30 minutes of MVPA most days, 33% reported some physical activity, and 17% were largely sedentary. Racette et al. (2008) also found that 29% of freshmen were largely sedentary.

In an ecological study to determine why college freshmen do not engage in regular physical activity, the reasons given by students included social invitations taking preference over exercise, lack of a training partner, significant commitment to do something else, and visiting family or friends instead (Gyurcsik, Spink, Bray, Chad, & Kwan, 2006). Institutional barriers included a large amount of schoolwork or a job taking much of the time outside of classes. Freshmen also stated that with the limited time available, relaxation and time for sleep took priority. These reasons differed greatly from those given by high school students, and the numbers of barriers were significantly higher than those offered by high school students.

In summary, regular physical activity has been found to be inversely related to weight gain, yet only a fraction of college students perform regular physical activity at the recommended level for weight maintenance and optimal health (ACHA, 2011; Wengreen & Moncur, 2009). In addition, the majority of college students exercise less frequently in college than they did in high school (Keating et al., 2005; McArthur & Raedeke, 2009; Racette et al., 2008). In a qualitative study, college students stated that the reason for the decrease in exercise was related to time constraints related to the increase in time required for school assignments and activities (Gyurcsik et all, 2006).

Therefore, within the current study, the Physical Activity subscale of the Health-Promoting Lifestyle Profile II (HPLP II; Walker et al., 1995) was used to determine whether the level of physical activity demonstrated a relationship with weight change in college freshmen.

Sedentary Behavior

Although regular physical activity has long been associated with a healthy BMI, recent research has begun to focus on two identified adverse behavioral trends—sedentary behavior and *screen time*. The newly coined term, *screen time,* refers to the amount of time spent on the computer, playing video games, or watching television (Boone, Gordon-Larsen, Adair, & Popkin, 2007). In a meta-analysis of six studies performed with older children and adolescents, a higher incidence of weekly hours of screen time and sedentary behaviors increased the risk for obesity. Conversely, fewer screen-time hours decreased the risk of adolescent obesity by 40% among females and 20% among males. Additionally, a reduction in screen time during the transition from adolescence to young adulthood was associated with lower obesity incidence, particularly for females.

Gordon-Larsen, Adair, and Popkin (2002) also found that the odds of overweight in adolescents and young adults were approximately 50% higher with high levels of television viewing/video gaming/computer use (> 35 hours/week) and were 14% lower with 7 or more sessions of MVPA/week in males. The obesity risk for females was 43% higher for high levels of screen-time activities (> 35 hours/week), with a 10% reduction in obesity risk with 7 or more sessions of MVPA/week. In a related study, Must and Tybor (2005) found that reducing television viewing and video gaming by only one

hour/day resulted in an additional energy expenditure of approximately 170 calories/day. Over the 1-year study period, however, reports of MVPA frequency and duration declined for both genders, by 10% for males and 8% for females. Decreased physical activity as adolescents become older has been noted in other studies as well (Boone et al., 2007; Sullum, Clark, & King, 2000; Wengreen & Moncur, 2009).

In later adolescence, the average number of hours spent watching television and playing games was 12 hours/week for men and 10 hours/week for women; the average number of computer hours was 7 hours/week for men and 5.5 hours/week for women (Boone et al., 2007). In women, television watching was negatively correlated with exercise and physical activity time, whereas time on the computer was negatively correlated with time spent on exercise/physical activity in men (Boone et al., 2007).

In two studies with college students, it was determined that males spent more time in physical activity, as well as overall screen time and television viewing, when compared with females , similar to the findings of studies on adolescents and young adults generally (Buckworth & Nigg, 2004; Fountaine, Ligouri, Mozumdar, and Schuna, 2011). Fountaine et al. (2011) also found that an average of 10.5 hours per week of screen time were spent on computers or gaming, with seven hours per week spent on television viewing. Buckworth and Nigg (2004) determined that computer use for men, and television watching for women, was negatively correlated with exercise and physical activity; however, in their study, Fountaine et al. (2011) noted that physical activity and sedentary behavior were not correlated.

In summary, an increase in sedentary behavior, and specifically, screen time, has been found to be a risk of weight gain in older adolescents (Boone et al., 2007), and also

demonstrated a significant difference in weight gain between males and females related to the type of screen time activity employed. Two studies also found an inverse correlation between the amount of time spent on sedentary behavior and physical activity in college students (Boone et al., 2007; Buck & Nigg, 2004). In the current study, the Sedentary Behavior Survey (Utter et al., 2003) was used to determine the relationship between weight gain and sedentary behavior during the first semester of college.

Nutritional Intake

Intake of foods and beverages high in calories and in large quantities is one of the most obvious variables associated with weight gain. Energy balance is attained when the level of energy intake (food consumption) is sufficient to offset the energy expended through metabolic processes and physical activity. When more calories (measured in kilocalories) are consumed than expended, weight gain occurs, resulting in an *energy gap*. On average, normal weight adolescents in the United States consume 110 to 165 kcal/day more than what is necessary for normal growth and development (Brehm & D'Allesio, 2010). This results in an average excess weight gain of 1 pound per year. Of greater concern is that adolescents who are already obese consume, on average, 700 to 1,000 kcal/day in excess of normal growth needs; this increased intake results in weight gain of more than 6 pounds per year (Wang, Gortmaker, Sobol, & Kuntz, 2006).

Factors within the current environment that increase caloric intake and increase the risk of obesity include large portion sizes, high-fat/energy-dense foods, fast foods, frequent snacking, and inexpensive food sources containing higher amounts of simple carbohydrates, fats, and sodium (Brehm & D'Allesio, 2010). According to the USDA (2009), older adolescents and adults require nine to 12 servings of grains (with at least

50% being whole or multigrain), two to three servings of fruit, three to five servings of

vegetables, three 2-ounce servings of meat/beans, and three servings of low-fat dairy

products daily to meet minimal nutritional requirements. Additionally, limits on

discretionary calories reduce the risk of weight gain. Discretionary calories are defined

as those found in energy-dense foods with low nutritional value, such as solid saturated

and trans fats; processed foods with high sodium, fat, and sugar content; and beverages

with high added sugar content, such as some juices, soft drinks, and alcoholic beverages

(Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004).

Beverage, Snack, and Fast-Food Intake

Based on 24-hour diet recalls from 4,357 adolescents from the 2001-2004

National Health and Nutrition Examination Survey (NHANES); Sebastian, Cleveland, &

Goldman, 2008), snack foods constituted 12% to 39% of the total portions of the

recommended food groups, 43% of total added sugar intake, and 24% of saturated/trans

fat intake for the day. Adolescents who snacked the most (up to four snacks per day)

consumed 50% more added sugars than nonsnackers, with 50% of those added sugars

derived from soft drinks and juices. For discretionary calories, more than 95% of all

participants went over the recommended caloric limits, with excess caloric intake ranging

from 772 to 1,122 kcal/day.

The contribution of fast-food consumption was also evaluated in adolescents

(aged 12-19 years, *N* = 1,956), using data from the 2003-2004 NHANES (Sebastian et al.,

2009). Based on a review of food recall diaries, 59% of the participants had consumed at

least one fast-food item in a typical day. Overall, fast food provided 17% of the total

intake for males and 16% for females. For all participants, the proportion of energy from

discretionary calories was between one-third and one-half of the total dietary intake for the day (mean intake, 648 kcal).

In addition, fewer than half of the participants in the study met the recommended daily requirements for any of the five food groups. When calculating discretionary calories, 99% of all participants consumed more than the recommended daily limit (Sebastian et al., 2009). In a related study, 30.3% of 14- to 19-year-olds ($N = 6,212$) consumed fast food on a typical day, resulting in an increase of 379 calories, or 16.8%, in the total daily intake of calories (Bowman et al., 2004). Fast foods were responsible for 38% of the total calories consumed, and the fast-food diet contained more total and saturated fats, more added sugars, more sugar-sweetened beverages, fewer dairy products, and fewer fruits and non-starchy vegetables.

Dietary Intake in College Students

Racette et al. (2008) found that only 29% of college students ate at least five servings of fruits and vegetables daily, with half reporting eating fast food at least twice in the previous week. The National College Health Assessment (ACHA, 2007) revealed that only 6.4% of college students reported eating the recommended five or more servings of fruit and vegetables daily, with 61% consuming only one to two servings daily. Huang et al. (2005) determined that less than 35% of college students ate five fruits and vegetables servings daily and that 60% did not eat the recommended amount of fiber.

Levitsky et al. (2004) performed a regression model to determine factors that accounted for first-semester college student weight gain, with initial weight used as a covariate. The researchers found that consumption of "junk food" (24%), meal frequency on weekends (17%), eating in the cafeteria, snack bar or a restaurant (9%), recent dieting

(9%), and evening snacks (6%) were major factors in explaining 71% of the variance. In the study, college freshmen gained an average 4.2 pounds in the first 12 weeks of the fall semester.

In another study, 95% of freshmen and sophomores reported eating at fast-food restaurants 6 to 8 times/week, with only 26.2% typically eating meals in the school cafeteria (Driskell, Young-Nam, & Goebel, 2005). Factors that were instrumental in food choice, in order of importance, were: convenience, 53.4%; taste, 42.9%; cost, 40.3%; health, 31.9%; weight control, 23.5%; and family/friend preference, 5.7%.

In summary, these studies demonstrate that excess caloric intake, consuming snacks and beverages high in fat and carbohydrates, and reduced intake of essential foods, including fruits and vegetables (fewer than five servings per day) result in risk of rapid weight gain (USDA, 2009). Therefore, the Nutritional Intake subscale of the HPLP II (Walker et al., 1995) and the Beverage and Snack Questionnaire (BSQ; Neuhouser et al., 2009) were used to study the effects of excessive snack, beverage, and fast-food intake on weight gain and increased BMI in college students.

Alcohol Intake

Excessive alcohol consumption has also been associated with obesity. Breslow and Smothers (2005) found that adults who drank four or more alcoholic drinks/episode had significantly higher BMIs than those who consumed fewer drinks/episode. In all respondents combined, the greater the number of drinks/episode, the higher the BMI. Binge drinking (consuming $\geq$ 5 drinks/episode once or twice monthly) put participants at higher risk for overweight/obesity than those who drank larger quantities more frequently (chronic drinkers). Breslow and Smothers (2005) have proposed that the weight gain

associated with binge drinking may come from one or more factors: an increase in caloric intake related to the alcohol itself, ingestion of more calorie-dense foods when under the influence of alcohol, or the fact that alcohol (being a liquid) does not trigger the satiety response.

Alcohol Consumption in College Students

Even though alcohol use is illegal during adolescence in the United States, alcohol consumption by minor college students is widely acknowledged and, even with legal sanctions in place, easily obtained. When queried, more than 68% of entering college freshmen (mean age, 17.94 years, $N = 774$) reported consuming alcohol in the previous three months (Sutfin et al., 2009). The typical number of drinks consumed per episode was 5.04, and the average number of drinks consumed per week was 8.87, with 46% reporting consumption of 5 or more drinks/episode and 27.3% reporting consumption at least twice a month. There were gender differences, with more males reporting drinking at least once per week (male, 33.2%; female, 24.7%) and males reported consuming a higher number of drinks/week (male, 11.14 drinks/week; female, 7.01 drinks/week). Economos et al. (2008) found the number of students who reported drinking alcohol more than doubled over the first year of college from 29% to 60%. In the National College Health Risk Behavior Survey (ACHA, 2007), 33.5% of students reported that they had drank five or more drinks/episode at least once in the previous 2 weeks.

Binge drinking (consuming ≥ 5 alcohol drinks/episode) has not only short-term high-risk consequences, but long-term health consequences as well. Adolescents who are heavy episodic drinkers (≥ 5 alcoholic beverages in one episode at least monthly) have an

increased risk of being overweight/obese (78.3% vs. 47.8% for non-heavy drinkers).

They have also demonstrated high-risk waist circumference (25.0% vs. 14.1% for non-heavy drinkers), and high blood pressure (35.0% vs. 15.5% for non-heavy drinkers), all risk factors for developing metabolic syndrome (Oesterle et al., 2004).

Binge drinking in university students has also been associated with unhealthy diet choices (infrequent breakfast consumption, reduced fruit/vegetable intake, increased fast-food intake and frequency), increased sedentary behavior, and increased risk of obesity (Nelson, Lust et al., 2009). In a study by Nelson, Lust et al. (2009), the prevalence of binge drinking for freshmen was 28.8% and increased each undergraduate year, up to 40.2% in the senior year. In addition, 32.2% of adolescents under the age of 21 reported binge drinking in the previous two weeks. Alcohol-related eating (before/during drinking) was reported by 80.8% of participants and was found to be significantly associated with a 25% increase in obesity. An increase in alcohol consumption has been linked to risk for weight gain in college students in earlier studies; therefore, the Drinking Patterns subscale from the Student Alcohol Questionnaire (SAQ; Engs, 2007), a measure of alcohol consumption frequency and amount, was included within the current study.

Stress Management

Increased stress, poor coping skills, and related excessive alcohol intake have been reported as risk factors for weight gain in college students (Martyn-Nemeth, Penckofer, Gulanick, Velsor-Freidrich, & Bryant, 2009; Ritter, 2006). Both physical and psychological stress can have an influence on the human immune system, as well as physical and psychological health status. Common stress triggers for college students include time pressure and deadlines, family or relationship difficulties, money problems,

a sense of not being in control, preexisting health or emotional problems, negative attitude, or anger. The pace of the academic experience for college students can create multiple stimuli of the stress response on a daily basis, leading to the development of chronic stress (Diener, 2005; Lai et al., 2005; Taylor, 2006).

College Freshmen and Stress

In a study of weight gain and related stressors over the first year of college (Economos et al., 2008), 80% of students experienced weight gain, and 70% of students cited peer relationships as the major source of stress. Both genders reported experiencing increased stress from academic performance, increased workload, and lower grades than expected. College freshmen also reported significant stress related to roommate conflict and academic performance. However, weight gain and level of stress were not significantly correlated in the study. Another study with college students found similar results, with no significant correlations between stress and weight gain (Nelson et al., 2008). However, in three qualitative studies with college students (Cluskey & Grobe, 2009; Greaney et al., 2009; Nelson, Kocos, Lytle, & Perry, 2009), stress was cited by students as a major reason for overeating and weight gain.

Therefore, there is preliminary and anecdotal evidence that stress is associated with weight gain in college students, but no existing data about whether or not an increase in stress management skills demonstrates a relationship with reduced weight gain. In the current study, stress reduction activities were measured through the Stress Management subscale of the HPLP II (Walker et al., 1995).

Interpersonal Relations

Pender's model stresses the importance of interpersonal relationships and communicating with others to make meaningful connections and achieve a sense of closeness and belonging (Walker et al., 1995; Pender et al., 2006). With the desire for greater intimacy, relationships with friends and love interests become more intense in emerging adulthood. However, relationships are often more volatile and are sometimes short-lived, and breakups and changes in friendships can create significant stress for college freshmen (Merten, Wickrama, & Williams, 2008). The formation of adaptive social relationships is especially important during adolescence, because adolescents rely strongly on their peers for the development and maintenance of their self-image and sense of belonging (Pearce, Boergers, & Prinstein, 2002; Swallen, Reither, Haas, & Meier, 2005).

Callaghan (2006) found that adolescents who had a strong support system exhibited a higher level of self-efficacy and number of healthy behaviors, and demonstrated a larger capacity for health-related self-care than did those who did not have a strong support system. In a related study, Wu and Pender (2002) found that peer support has a direct influence on physical activity in adolescents. Social support is a vital part of the Interpersonal Relations subscale of the HPLP II; one item on the subscale is to "get support from a network of caring people" (Walker et al., 1995, item #43).

College Freshmen and Interpersonal Relationships

Although some freshmen students experience positive social support at college, with friends joining in physical activities and encouraging healthy food choices, other freshmen state they did not find social support for these health-related behaviors (Nelson,

Kocos et al., 2009). Conversely, there are negative social pressures to overeat, to eat fast food on a frequent basis, and to drink excessive amounts of alcohol in college; all these factors contribute to weight gain (Greaney et al., 2009).

Being able to settle conflict with others is an important area in interpersonal relations. College students also stated that the lack of family social support, lack of healthy family routines, and feelings of instability in the first year of college were major reasons for weight gain (Clusky & Grobe, 2009). In a related study to identify psychosocial risks in the semester of college (Economos et al., 2008), 70% of freshmen identified interpersonal conflicts within relationships as the primary reason for increased stress and associated weight gain over the first year of college. Therefore, in this study, the Interpersonal Relations subscale of the HPLP II (Walker et al., 1995) was used to determine whether there was a significant relationship between interpersonal relations and weight change in college freshmen.

Spiritual Growth

The developmental stage of late adolescence/emerging adulthood is a time for an exploration of self-identity and spirituality, and college students are eager to discuss issues of morality, ethics, altruism, and religiosity with friends and family, and within the classroom (Pope, 2005). In a survey of more than 112,000 U. S. college freshmen, 80% stated they were interested in spirituality, 75% were actively searching for the meaning of life, and more than 75% stated that they believed in God (UCLA Higher Education Research Institute (UCLA, 2005). College freshmen ascribed importance to "improving my understanding of other countries and cultures" (42%), "improving the human condition" (53%), and "feeling a strong connection to all humanity" (76%; UCLA, 2007,

p. 2). In addition, "very important" or "essential" life goals included "integrating spirituality into my life" (42%), "developing a meaningful philosophy of life" (41%), "attaining inner harmony" (49%), "seeking beauty in my life" (54%) , and "becoming a more loving person" (67%; UCLA, 2007, p. 1).

However, although 68% stated that their beliefs provided guidance, 48% of freshmen admitted to feeling "conflicted," "seeking," and "doubtful" about their spiritual worldview (Bartlett, 2005, para. 1). Furthermore, a majority of students expressed a desire to pursue dialogue about ecumenical topics within the university environment, but more than 60% reported that professors never encouraged discussion of the subject; only 20% of professors provided the opportunity to discuss the meaning and purpose of life within the classroom (UCLA, 2005).

Findings also reveal a strong relationship between high levels of spirituality and positive health practices, including abstaining from alcohol and cigarettes, consuming healthier diets, and reporting better physical health (UCLA, 2007). Coping abilities in response to stressful life events were also higher in college students with higher levels of spirituality (UCLA, 2005). Callaghan (2005) also found a strong relationship between spiritual growth and self-care responsibility and initiative.

Although these studies suggest that there is an association between spirituality and healthy behavior, none have directly examined spirituality and weight change. Therefore, in this study, spirituality, operationalized through the Spiritual Growth subscale of the HPLP II (Walker et al., 1995), was included as a potential predictor of change in weight and BMI during the freshmen year of college.

Health Responsibility

Consistent adherence to planned health promotion behaviors can greatly improve the likelihood of success in maintaining a healthy weight for college students (Zeller et al., 2007). In addition to spiritual health and health self-efficacy, *health responsibility* also plays a significant role in healthy behavior (Callaghan, 2003). Health responsibility involves "the actualization of goal-directed behavior and competent self-care" (Callaghan, 2003, p. 247) to promote personal balance within the present environment.

Outside influences include health education and the recommendations of health professionals that encourage the practice of behaviors that improve health (Walker & Hill-Polerecky, 1996; Callaghan, 2003). The motivation to abstain from, or change, unhealthy or risk behaviors is dependent on the level of dissatisfaction with the present situation and the perceived benefits derived from healthy behaviors and the personal, interpersonal, and situational conditions present within the environment (Pender et al., 2006).

In a study of college students, Jackson, Tucker, and Herman (2007) found that health self-efficacy (confidence and competence to carry out health-promoting behaviors) and health value (a belief that specific health-promoting behaviors are essential for personal well-being) predicted 51% of the level of engagement in health promotion behaviors. These behaviors included activities related to nutrition, psychological well-being, physical activity, and general preventive health practices. Those students who indicated that a healthy lifestyle was very important also performed a larger number of healthy lifestyle behaviors. Callaghan (2003, 2005, 2006) reported similar findings in both adolescents and adults. Therefore, the Health Responsibility subscale of the HPLP II

(Walker et al., 1995) was included in this study to determine whether there is a relationship between the level of health responsibility and weight gain in the first year of college.

Summary and Conclusions

Within the developmental stage of emerging adulthood, an increase in high-risk behaviors can be the norm in college students. A desire for novel and intense experiences, or *sensation seeking*, is part of the normal developmental stage of identity exploration in young adulthood (Arnett, 2007a; Arnett, 2007b; Wechsler, Lee, Nelson, & Lee, 2001). Therefore, high risk and unhealthy lifestyle activities, such as sporadic eating routines, high caloric intake, high levels of stress, increased alcohol intake, and reduced physical activity can all be additive factors in the precipitous weight gain and increased BMI experienced during the college years (CDC, 2012; Eisenberg, Neumark-Sztainer, & Lust, 2005).

Excessive weight gain in college can lead to obesity, which increases the likelihood of both short-term and chronic health problems if obesity continues into adulthood. Conversely, a healthy change in lifestyle can greatly improve the likelihood of success in maintaining a healthy weight for college freshmen. According to the HPM (Pender et al., 2006), identification of personal, interpersonal, and situational factors are crucial to understanding the benefits and barriers to performing health-promoting behaviors. In this study, the risk of rapid weight gain within the university environment was explored.

Through a comprehensive literature review, the independent variables of BMI and BMI category, height change, gender, race, ethnicity, physical activity, sedentary

behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress

management, interpersonal relations, spiritual growth, and health responsibility have been

identified as possible factors that have an influence on significant weight gain in the first

year of college. These identified factors were operationalized through a survey instrument

to explore their influence on weight gain and increased BMI in the first semester of

college and are discussed in Chapter 3. The research methodology and planned analysis

of data are also discussed.

CHAPTER 3

METHODS

The purpose of this study was to determine the personal, interpersonal, and situational variables that predict significant weight change in freshmen within the university environment. The study utilized an exploratory design with weight/height measurement and a written, online data collection instrument at weeks 2-3 (T1) and weeks 16-17 (T2) of the freshman, first semester of college (fall semester, 2011). The dependent variable for the study was weight change from T1 to T2, a 15-week time span. The independent variables included BMI category, height, gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility. The specific aims for this study were to:

1. Determine whether college freshmen experience significant weight change in the first semester of college.

2. Examine the effects of gender, ethnicity, and race on weight change in college freshmen during the first semester of college, after controlling for baseline BMI category and any change in height.

3. Assess the additional predictive value of physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility on weight change in college freshmen in the first semester of college.

Setting

The setting for the study was a public Southwestern university, Eastern New Mexico University (ENMU). The main campus of ENMU is located in the rural community of Portales, New Mexico, and has an annual enrollment of approximately 5,550 students (ENMU, 2012). ENMU offers more than 60 associate's, bachelor's, and master's degrees, with the most popular majors being in Business Administration, Education, Biology, Nursing, Psychology, Communication, and Criminal Justice. ENMU is the third largest university in New Mexico, after UNM and New Mexico State University.

Portales (meaning "porches" in Spanish and named for local rock formations) is a rural community located at the approximate midpoint of New Mexico's eastern state border, 22 miles west of the Texas state line. The closest metropolitan areas are Lubbock, Texas, 105 miles to the east, and Albuquerque, New Mexico, 225 miles to the northwest. Students state that they choose ENMU for the small class sizes, affordability, and academic quality. The tuition is the second lowest in New Mexico for 4-year state universities, and for the past 10 years, ENMU has had the highest student satisfaction rate (96.5%) of all New Mexico universities (ENMU, 2010).

In the fall 2011 semester, 689 freshmen enrolled at ENMU's main campus in Portales, with more males (355/51.5%) than females (334/48.5%). Race/ethnicity for the 2011 first-time freshmen class was: 44.1% non-Hispanic White, 37.1% Hispanic, 5.7% Black/African American, 3.6% American Indian, .03% Asian, and 6.5% other/unknown (Table 1). Table 2 shows the average age of entering freshmen is 19.47 years, with males (19.59 years) slightly older than females (19.33 years; ENMU, 2012).

For incoming freshmen in the 2011 fall semester, approximately 75% lived in dormitory housing, 69% received some form of financial aid, and 94% were residents of either New Mexico or Texas (ENMU, 2012). Traditional freshmen for this study were defined as students who were recent high school graduates with fewer than 30 college-credit hours, lived in dormitory housing, and were 18 to 19 years of age. Unmarried, childless freshmen are required to live in dormitory housing and purchase the cafeteria meal plan at ENMU, unless a legal guardian or parent lives within 50 miles of the university (ENMU, n.d).

Table 1. *First-Time ENMU Freshmen by Race/Ethnicity (Fall 2011)*

Freshmen	African American/ Black	Native American	Asian	Hispanic	White	Unknown /Other	Two or More Races	Total, *n* (%)
Number (*n*)	39	24	2	255	304	45	20	689(100)
Percent (%)	5.7%	3.6%	.03%	37.1%	44.1%	6.5%	3.0%	(100.03%)

Note. From ENMU (2012).

Table 2. *Age of ENMU Freshmen by Gender and Race/Ethnicity (Fall 2011)*

Mean Age	African-American / Black	Native American	Asian	Hispanic	White	Unknown /Other	Two or More Races	All
Males, years	19.53	18.88	25.50	19.48	19.74	19.41	18.92	19.59
Females, years	19.74	18.88	18.00	19.20	19.49	18.57	20.17	19.33
Average								19.47

Note. Totals include full-time freshmen and freshmen who may be in their third semester of attendance but are still classified as freshmen based on completed credit hours. From ENMU (2012).

Sample

The convenience sample for this study included traditional college freshmen who attended classes on the main campus of ENMU in Portales, lived in dormitory housing, and purchased the mandatory cafeteria food plan in the fall semester of 2011. Potential freshmen participants were recruited through the 3-credit-hour course Freshman Seminar. In this mandatory course, college freshmen "find their place in both academics and social

settings" within a collaborative learning environment that provides students with "the opportunity to make connections, form friendships, and accomplish their educational goals" (ENMU, 2011, Learning Communities para. 1). Within this interactive and didactic course, students obtain essential learning skills (time management, note-taking, test-taking, accessing resources); explore majors and core course requirements; discuss culture, diversity, and ethics; explore the concepts of wellness and a healthy transition into adulthood; are exposed to university history and traditions; and are encouraged to participate in a wide variety of university activities.

Inclusion and Exclusion Criteria

Participants were included in the study if they were college freshmen between the ages of 18 and 19 at the time of enrollment, lived in college dormitories and purchased the cafeteria meal plan; were able to write, speak, and read English fluently; and were enrolled during the fall 2011 semester as their first semester at a college or university. Students were excluded if they had 30 credit hours or more of previous college course work, had children, were pregnant, or were married. Students who were unable to provide independent consent were also excluded.

<center>**Power Analysis**</center>

An a priori power analysis was conducted using G*Power 3.1.3 software (Institut Für Experimentelle Psychologie, 2008) to estimate an adequate sample size for this study for a multiple regression to determine which of the independent variables (12) predicted a change in weight in college freshmen. Possible predictors included BMI category, height, gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage

and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility.

For a medium standardized effect size estimate ($f^2 = 0.15$), corresponding to an overall R^2 of approximately .13 against a null hypothesis that $R^2 = 0$), with an alpha of 0.05, power of 0.80, and 14 predictors, the minimum sample size calculated was $N = 135$. The original plan was to enroll 225 to 280 participants to allow for an attrition (loss to follow-up) rate of up to 40% between T1 and T2. This was considered to be a sufficient sample to obtain significant findings, with a minimum of 135 to 170 of the participants completing the study, while maintaining 80% to 90% power to detect a medium effect size for the model as a whole (as defined above). A total of 166 participants were recruited for the study, but only 90 completed the height and weight measures and the survey at T1. Of these 90 participants, 76 had completed both height and weight measures and the survey at both T1 and T2, so the power analysis was recalculated. The number of predictors that could be employed was reduced to three, to retain the power at 0.80, medium effect size, and an alpha of 0.05.

Procedure for Data Collection

Approval from UNM's institutional review board (the Human Research Protection Office [HRPO]) and ENMU's Human Subjects Committee was obtained prior to study implementation (see Appendix A for approval letters). In the fall 2011 semester, 15 course sections of Freshman Seminar on the ENMU Portales campus were selected for recruitment of study participants. The course length was 16 weeks over the entire fall semester (the 17th week was reserved for final course examinations; students were on campus but were not following the regular course schedule).

The co-investigator (CI) was the College of Nursing PhD student who had designed the study, collected the data, and performed the statistical/data analysis as part of her dissertation. The principal investigator (PI) was the Chair of the CI's dissertation committee and provided oversight of all facets of the study's processes and procedures. The Research Assistants (RAs) were four ENMU students who had been trained on research protocols for the collection, storage, and retention of data collected during the research study and satisfactorily completed the basic Collaborative Institutional Training Initiative (CITI) certification required by the UNM HRPO. The RAs were also trained by the CI to correctly obtain height and weight measures on participants, and the CI was always present when data collection and data management processes were performed.

Recruitment of Participants

Freshman Seminar classes comprised 20 to 25 students each, and up to 29 course sections were used for recruitment of participants for this study. To obtain instructor approval from Freshman Seminar course sections, the CI presented the study proposal, via a PowerPoint™ presentation, to all Freshman Seminar instructors before the fall semester began. After the short (10-15 minute) presentation, the PI asked the instructors for permission so that their students might participate in the study from their course sections. This permission also granted approval for the CI, or designated RAs, to pull students from the classroom for one class period at the beginning of the fall semester at T1 (Week 2) and one class period at the end of the semester at T2 (Week 16).

In Week 1 of the 2011 fall semester, a flyer describing the study to the students was distributed in their Freshman Seminar course sections (flyer example is in Appendix B of the application.) Students who wished to participate went to the Becky Sharp

Auditorium in the College of Business (COB), the designated study site, at T1 on the

days and at the times available (Table 3). One or two of the RAs went to each of the

Freshman Seminar classrooms to remind the students/instructors at the beginning of

class, on the date indicated, to go to the designated room to participate in the study.

Table 3. *ENMU Freshman Seminar Schedule for Week 2 (T1): Consent and Height/Weight (Fall 2011)*

Course/Section #	Class Starts	Class Ends	Class Duration, minutes	Date/Day Reserved	COB Room #
059/066	9:00 AM	9:50 AM	50	Mon., 08/29/11	COB 104
069/070	10:00 AM	10:50 AM	50	Mon., 08/29/11	COB 104
049/050	11:00AM	11:50 AM	50	Mon., 08/29/11	COB 104
041/056	1:00 PM	2:15 PM	75	Mon., 08/29/11	COB 104
045/061	9:30 AM	10:45 AM	75	Tue., 08/30/11	COB 104
048/052	11:00 AM	12:15 PM	75	Tue., 08/30/11	COB 104
040/047	1:00 PM	1:50 PM	50	Wed., 08/31/11	COB 104
073	2:00 PM	3:15PM	75	Wed., 08/31/11	COB 104

Note: COB = College of Business.

Students who were not interested in participating in the study attended their

regularly scheduled Freshman Seminar course section. Electing not to participate in the

study did not affect the students' grades and did not create any academic disadvantage to

nonparticipating students. Similarly, participation in the study did not create an adverse

effect academically, because the instructors gave consent for students to participate. The

PI, CI, and RAs had no connection to or influence over the Freshman Seminar course

section instructors or activities.

The CI met with the students during the second week of classes (T1), during the

regularly scheduled Freshman Seminar course times. The CI provided a brief overview of

the study, including the general purpose, eligibility and exclusionary criteria, and data

collection requirements, which included completing the Health, Education, and Lifestyle (HeLP) survey and height/weight measures, at both T1 and T2. The HeLP survey was created for this study by combining questions from four other lifestyle-related questionnaires. The study consent form (Appendix B) was distributed, and each section of the consent form was reviewed by the CI. Participants were advised to read the consent form thoroughly before signing. The CI was available to answer any questions that participants had on an individual basis. Once the CI satisfactorily answered any questions of potential participants, students who did not meet the criteria for inclusion or did not wish to participate returned to their regular Freshman Seminar course section.

Students from 15 Freshman Seminar courses were initially recruited. However, by the end of Day 3 of T1, the CI determined that more participants were needed, and students from the remaining 14 courses were recruited in a similar manner by contacting their freshmen instructors and providing the study flyer and collection time information to students in these courses. A room was reserved in the College of Business for each time designated on Table 3. Students that met the inclusion criteria and elected to participate in the study went to the designated room in the College of Business during these times.

Each consent form had a business-sized, laminated card attached, with a unique 3-digit study identification number and CI contact information. After the consent form was signed, participants completed the Contact Information Form, which included the participant's name, study identification (study ID) number, an email address, and personal telephone/cell number (Appendix B). Participants were advised to keep this Study ID Card in a safe place after the first height and weight measure and HeLP survey

data were collected, because the Study ID Card was needed again at T2, when the second height and weight measures and survey were collected.

The personal identifiers were linked with the study ID number on an Excel Study Roster, in case a participant lost the Study ID Card with the study ID number. Additionally, the email and telephone number were used to provide participants with study information and the hyperlink to the HeLP survey at T1 and T2. The email account and telephone number were also used to inform participants of the location, date, and time of the T2 survey and height and weight collection sessions. During T2 collection, if the participant did not have the study ID number available, participants were given the study ID numbers once their full names and dates of birth was provided to the CI.

Data collected for this study included height and weight measures obtained at both T1 and T2 by the CI or RAs, and participants completed the 89-item HeLP survey, which was located on the SurveyMonkey web portal, also at T1 and T2. The SurveyMonkey web portal was accessible from any computer with Internet access.

Sample Size

Participation varied for the four points of collection. For example, height and weight were collected on 166 participants at T1, and out of that sample, 90 completed the HeLP survey (46% attrition rate). The survey was not available at the time of the height and weight collection, either in written or on-line format, and participants were instructed that the survey would be sent through their email address within the following week. [Contact e-mail addresses and phone numbers were provided by the participants at the time of T1 height and weight collection.] Follow-up emails and phone calls/text messages were also employed to encourage completion of the HeLP survey at T1 for

those who did not complete the survey within several days, but with negligible success.

At T2, there were 76 remaining participants with complete data from the original 90

(15.6% attrition rate from T1).

Height and Weight Collection Procedure

Each participant was provided with a Height and Weight Form (see Appendix B)

at T1 and T2 and was asked to write the unique study ID number from the Study ID Card

onto the form, along with his or her full birth date and gender. This information was

required to calculate accurate participant BMI information.

The RAs or the CI asked participants to empty their pockets, take off their shoes,

and remove jackets, cardigans, or any extra layers of clothing. The weight was obtained

on a digital scale and was recorded on the Height and Weight Form, measured in pounds

to the nearest 1/10 of a pound. The height was obtained by using a portable stadiometer

and was recorded to the nearest 1/8 inch.

Two scales (same brand and style) and two stadiometers (same brand and style)

were used for the measurement of height and weight. The scales and stadiometers were

designed as portable measurement instruments. The stadiometers were checked for

accuracy before use in the study by an RA, who had his or her height checked on both

stadiometers. The height measurements needed to be exact on both stadiometers for both

of them to be used, which occurred in all instances. The scales were also calibrated each

day that measurements were taken by weighing the same person on both scales. Results

of these calibration tests were recorded in a Height and Weight Log (see Appendix B)

established for this purpose and was securely maintained by the CI with other study

records.

Once the height and weight measures were recorded for each participant and the

form was checked for completion of all necessary information, the form was collected by

the CI or an RA. Later, the BMI and BMI category were calculated by the CI and an RA,

using the CDC (2011) BMI calculator for children and teens through age 19, which is

available online. The CI checked 10% of the RA's calculations for accuracy, and the

information was entered onto the Height and Weight Form and on an Excel data

spreadsheet. At T2, the height/weight measurement procedure was repeated, using the

same method.

Using the email addresses provided on the Contact Information Form, participants

were reminded to take the HeLP survey again at T2 (Weeks 14 through 16), and the

hyperlink to the SurveyMonkey web portal was included in the email. The Freshman

Seminar instructors were also reminded in Weeks 14 and 15 that participants needed to

complete the second weight and height measurements. A schedule with days, times, and

locations for the T2 height and weight measures in Week 15 was included in emails to

both the participants and instructors. The same two portable stadiometers and digital

scales were used for the T2 data collection, and quality control was performed on the

days that height and weights were obtained, as previously described.

BMI Categories

BMI status was determined by obtaining a BMI based on age and gender at both

T1 and T2. This was achieved by inputting each participant's birth date, date of

collection, gender, height, and weight into the web-based BMI Calculator for Child and

Teen (CDC, 2011). The BMI categories were determined, based on the BMI category

(underweight = < 18.5 kg/m^2; normal = 18.5–24.99 kg/m^2; overweight = 25.0–29.99 kg/m^2; and obese ≥ 30.0 kg/m^2).

Height Change

Change in height was defined as the amount of change between the height measure at T1 and the height at T2, calculated by subtracting the height at T1 from the height at T2. The height change was measured to the nearest 1/8 inch.

HeLP Collection Procedure

The HeLP survey was developed for this study from an aggregate of four distinct instruments that contain personal, interpersonal, and situational characteristics that have been found to have an influence on weight gain in adolescents and college students in prior studies. These included the BSQ, the SAQ drinking patterns subscale, the HPLP II survey, and the Sedentary Behavior Scale (SBS; Engs, 2007; Neuhouser et al., 2009; Utter et al, 2003; Walker et al., 1995). The four instruments remained intact as designed by the original authors. The HeLP survey was available through the SurveyMonkey website during T1 and again at T2 in the Fall semester. Participants were informed that they needed to complete the survey during these two collection times.

A $10 incentive was offered to participants, at the end of the study, to encourage completion of the collection instruments (height/weight measurements and online HeLP survey), both at T1 and T2. Additionally, all participants were contacted at T1 and T2 via the personal email address and/or phone text or call to remind them to complete the survey and to come for the T2 height and weight measurements. Reminder text messages or telephone calls to participants were also sent to those participants who had not completed the HeLP survey at either collection time. Participants were also reminded to

complete the HeLP survey during the height and weight measurements. At T2, a bank of five laptops was made available for participants to complete the study survey if they had not already done so. Participants who had completed the study elements were given the $10 incentive at the time of the T2 height and weight collection.

Measures and Instruments

The following section provides a summary of the operational definition for each of the variables used in this study. Change in weight from T1 to T2 was the dependent variable. The independent variables included the personal, interpersonal, and situational attributes of BMI category; height; gender; race; ethnicity; physical activity; sedentary behavior; nutritional intake; beverage and snack intake; alcohol consumption; stress management; interpersonal relations; spiritual growth; and health responsibility.

Dependent Variable: Weight Change

Change in weight was defined as the amount of change between the weight measure at T1 and at T2, as measured by subtracting the weight at T1 from the weight at T2. A decrease in weight from T1 to T2 was represented by a negative number, whereas weight gain was represented by a positive number.

Independent Variable Measures

Body mass index. The BMI was determined by inputting each participant's birth date, date of collection, gender, height, and weight into the web-based BMI Calculator for Child and Teen (CDC, 2011). The calculated BMI was then entered onto the Excel data spreadsheet directly from the Height and Weight Form for both collection times. The BMI categories were also calculated and placed on the Excel spreadsheet.

Height. The measurement of height at each measurement was entered onto the Excel data spreadsheet, along with the weight and BMI for T1 and T2. Change in height for each participant was calculated by subtracting the height at T1 from the height measurement at T2.

HeLP survey. The HeLP survey, the data collection instrument used in this study, was an aggregation of four established instruments (Appendix C). The four instruments remained intact as designed by the original authors and are described in detail below. The reliability and validity established for each of the instruments are also reported. The survey was the instrument used to measure all independent variables, with the exception of BMI, BMI category and height, and included items regarding gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility. A summary of the instruments can be found in Table 4. Each instrument or subscale used within the HeLP survey is described below, as well as the reliability and validity estimates for each of the instruments that make up the HeLP survey.

Gender. Gender was self-identified (Item 3 on the HeLP survey), with participants making the dichotomous choice of either *male* or *female*. Male was used as the reference category (coded 0).

Pregnancy. The question regarding pregnancy was answered by females only. None of the females who completed the survey at both T1 and T2 stated they were pregnant.

Race and ethnicity. Race and ethnicity were self-identified according to guidelines from the UNM (n.d.) Federal Race and Ethnicity Code Compliance Project: Two Question Format and Phrasing form, which is based on federal guidelines for reporting of race and ethnicity (Office of Management and Budget, 1997; U.S. Census Bureau, 1999). This form was developed by UNM officials to fulfill the federal requirement for statistical reporting purposes.

Race categories included American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White. For race, a series of dummy variables were created; White was the reference category (coded 0 across all contrasts). Ethnicity was expressed as a dichotomy: Hispanic or Latino vs. Not Hispanic or Latino. Ethnicity was dummy coded with "Not Hispanic" as the reference category (coded 0).

Beverage and snack questionnaire. For this study, snack and beverage intake was measured using the BSQ, which included questions about snack foods and beverages, with both healthy and unhealthy choices (Neuhouser et al., 2009). The BSQ was represented by items 6 to 25 on the HeLP survey. The 19 items on the questionnaire addressed the intake of foods and beverages that are higher in caloric content and lower in nutritive value, and compared these items with healthier snacks (such as fresh fruits and vegetables) and beverages (such as water and milk; Neuhouser et al., 2009).

Table 4. *Components of the Health and Lifestyle Profile (HeLP) Survey*

Name of Instrument/Survey	Description	Response Set (Question # on HeLP Survey)	Reliability	Scoring of Instrument/Survey
Survey Code	Study ID Number	3-digit number (Item 1)	- - - -	Assigned 3-digit study ID number, 100-300
Gender	Self-identification of gender	2 response choices, categorical (Item 3)	- - - -	Dummy coding 0,1
Females–Pregnant	Yes/No	2 response choices, categorical (Item 3b)	- - - -	Determine pregnancy status
Federal Race/Ethnicity-Code Compliance Project: Two Question Format and Phrasing[a]	Self-identification of race and ethnicity	1 response choice, Hispanic–Y/N (Item 4) 5 response choices-race (Item 5)-categorical	- - - -	Hispanic dummy coding 0,1 5 race categories, dummy coding-0,1
Beverage and Snack Questionnaire[b]	19-item questionnaire, with 10 healthy and 9 unhealthy snack or beverage choices	7 response categories (level of measurement; ordinal at the item level, interval at the scale level). (Items 6-25)	4-6 week test/retest 2 student groups (n= 46) r =.74-.77, beverages; r =72-.75, snacks; r = 73-.85, fruits/veg.	A higher score represents higher frequency of unhealthy food/beverage intake. Mean score range from 1 to 7 Healthy snack/beverage items were reverse coded
Student Alcohol Questionnaire-Drinking Patterns subscale[c]	6-item Drinking Pattern subscale, 3 questions about quantity and 3 questions about frequency of drinking alcohol (beer, wine, liquor, or spirits)	5 frequency response categories (level of measurement ordinal at the item level, interval at the scale level). Quantity on each occasion 5 response categories: (Items 26-31) (level of measurement ordinal at the item level, interval at the scale level)	Spearman-Brown split half (n = 6,534 undergraduates) (r = .84) Cronbach's alpha = .86[d]	Response values indicated the fewer alcoholic drinks consumed and lower frequency have a higher value Mean score range 1 to 5
Health-Promoting Lifestyle Profile II [e]	52-item survey with 6 subscales: Physical Activity Nutrition Stress Management Interpersonal Relations Spiritual Growth Health Responsibility	4 response categories, (Items 32-83) (35,41,47,53,59,65,71,77) (33,39,45,51,57,63,69,75,81) (36,42,48,54,60,66,72,78) (32,38,44,50,56,62,68,74,80) (37,43,49,55,61,67,73,79,83) (34,40,46,52,58,64,70,76,82) (level of measurement ordinal at the item level, interval at the scale level).	Total scale: Cronbach's alpha .94 (n =712 adults) 6 subscales range .79 to .87 Total scale 3-week test/retest, r = .89[f]	All survey items are phrased in a positive, health-promoting manner. Inverse relationship between the subscale scores and increase in BMI is proposed. Separate score calculated for each subscale and divided by the number of subscale items. Possible mean score range from 1 to 4
Sedentary Behavior Scale[g]	6-item survey regarding sedentary behavior, specifically TV/video watching, computer use unrelated to schoolwork, and studying and reading related to homework, weekday vs. weekend	Seven response categories, (Items 84-89) (level of measurement ordinal at the item level, interval at the scale level).	2-week test/retest (n = 167 jr./high school students) TV/video (r = 0.69, 0.80), Computer (r =.66, .71), Reading/homework (r =.60, .60)	Possible mean score range is 1-7 An increase in sedentary behavior is related to an increase in weight, so the value remains positive

[a]UNM, n.d. [b]Neuhouser et al., 2009. [c]Engs, 2007. [d]Engs & Hanson, 1994. [e]Walker et al., 1995. [f]Walker & Hill-Polerecky, 1996. [g]Utter et al., 2003.

Both healthy and unhealthy snacks and beverages were included on the questionnaire—10 healthy food or beverage choices and nine unhealthy choices. There were nine questions regarding beverage intake, nine questions regarding snacks and sweets, and two regarding fruit and vegetable intake (Neuhouser et al., 2009). The root question was, "Over the past week, how many times did you eat (or drink) the following?" Possible response choices for each item were 1 (never/less than once per week), 2 (once per week), 3 (two to four times per week), 4 (five to six times per week), 5 (once per day), 6 (two to three times per day), and 7 (four or more times per day).

A positive number represented the score for each unhealthy snack or beverage choice, whereas the score for a healthier snack or beverage was reversed (1 = 7, 2 = 6, 3 = 5, 4 = 4, 5 = 3, 6 = 2, 7 = 1). Questions on the HeLP survey regarding a healthier choice of beverage or snack included items 6, 8, 9, 10, 13, 14, 15, 21, 23, and 24. Higher scores on the BSQ indicated a higher level of unhealthy beverage and snack intake. The mean score for the BSQ was obtained by adding the total summed score for the 19 items (after reversing scores for healthier food choices) and then dividing the total by 19 for a mean BSQ score; the mean score on the BSQ ranged from 1 to 7, with higher scores indicating more frequent unhealthy choices.

The BSQ was developed as a short, concise tool to use in place of an extensive food diary. A multidisciplinary panel developed the 19-question survey based on a previously validated snack questionnaire and included healthy food selections frequently missing from the adolescent diet as well. Then 31 middle- and high-school students were asked to complete the survey and "think out loud" (Neuhouser et al., 2009, p. 1588) about the questions and the responses available. Using this qualitative data, minor revisions

were made to the BSQ, clarifying content by adding specific brand names of some of the snacks and beverages, and adding more examples. Once this was completed, the BSQ was administered to a different group of 50 adolescents in two different classrooms, and minor revisions were made based on student feedback.

Neuhouser et al. (2009) performed test–retest reliability on the BSQ, separated by 4 to 6 weeks, in two groups of students ($n = 46$). Test–retest reliability coefficients ranged from .72 to .85 for beverages, snacks/sweets, and fruits/vegetables; there were no significant differences between the two groups tested. In addition, criterion validity was performed by having students complete a 4-day food diary, 1 week before the second administration of the BSQ. Correlations (validity coefficients) between the food diary and BSQ ranged from 0.56 to 0.87, leading the researchers to conclude that the BSQ was reasonably comparable to completing an extensive food diary.

SAQ drinking patterns subscale. Alcohol intake relates to the frequency and number of alcoholic beverages consumed during each episode (Nelson, Lust et al., 2009). A six-item Drinking Patterns subscale from the SAQ was used for this study (Engs, 2007). Three items ask about the frequency of alcohol intake: "How often, on average, do you usually have a beer/wine/liquor or spirits (e.g., whiskey, gin, vodka, mixed drinks)?" Responses include: 1 (every day), 2 (at least once a week, but not every day), 3 (at least once a month, but less than once a week), 4 (more than once a year but less than once a month), or 5 (once a year or less/never).

The other three items ask about the quantity of alcohol consumed: "When you drink beer (wine or liquor or spirits), how much, on average, do you usually drink at any one time?" The response set includes: 1 (over six), 2 (five or six), 3 (three or four), 4 (one

or two), or 5 (less than one/none; Engs, 2007). The higher the frequency of alcohol consumption and the greater the number of alcoholic drinks consumed on each occasion, the lower the number on the SAQ (Engs, 2007).

In 1975, the SAQ, which contains 23 questions on drinking-related behavior, was developed. Six of the questions regarding drinking behavior were adapted from three prior studies to determine the quantity and frequency of alcohol intake. These six questions were used for this study. The remaining 17 questions developed were to query about problems, knowledge, and attitudes relating to alcohol consumption (Engs, 1977; 2007). Additionally, a panel of experts working in the areas of alcohol education and research reviewed the questionnaire items. After expert input, the preliminary questionnaire was provided to a group of college students for further comments and suggestions. Based on their input, the questionnaire was again revised and resubmitted to the expert panel. After further revisions were made, 122 college students completed the 23-item SAQ twice over a 1-month interval (test–retest). The test–retest reliability coefficients ranged from .61 to .92, with a mean of .79 (Engs, 1977).

In 1991, 6,534 undergraduate students attending 104 different colleges and universities were administered the full SAQ questionnaire. The Spearman-Brown split-half technique was applied to each of the four subscales. The six-item Drinking Patterns subscale used in the current study was found to have a test–retest reliability coefficient of .84, with a split-half coefficient of .86. The test–retest reliabilities of the individual items for the subscale ranged from .50 to .73 (Engs & Hanson, 1994). No validity testing was performed on the SAQ as a whole, or the Drinking Pattern subscale specifically, in the 1994 study.

Health-promoting lifestyle profile II. The HPLP II, represented by questions 29

to 86 on the HeLP survey, is a 52-item survey with six subscales and was used to

measure the variables of physical activity (8 items), nutritional intake (9 items), stress

management (8 items), interpersonal relationships (9 items), spiritual growth (9 items),

and health responsibility (9 items; Walker et al., 1995). The HPLP II was revised in 1996

to measure health-promoting behaviors. It has been used in more than 60 nursing research

studies since its inception. In the development of the HPLP II, content validity was

established by literature review and content-expert evaluation (Walker & Hill-Polerecky,

1996).

In 1996, the HPLP II was administered to 712 adults, aged 18 to 92 years, to

assess validity and reliability. According to Walker and Hill-Polerecky (1996), construct

validity was achieved using factor analysis, which confirmed a six-dimensional structure

of health-promoting lifestyle by convergence with the Personal Lifestyle Questionnaire

($r = .678$) and by a non-significant correlation with social desirability. Criterion-related

validity was indicated by significant correlations with concurrent measures of perceived

health status and quality of life (r's = .269-.491). The alpha coefficient of internal

consistency for the total scale was .943; alpha coefficients for the subscales ranged from

.793 to .872. The 3-week test–retest stability coefficient for the total scale was .892.

Response choices for all items on the HPLP II subscales ranged from 1 to 4: 1 =

never, 2 = sometimes, 3 = often, and 4 = routinely. For each of the six subscales,

responses were summated, then divided by the number of items per subscale, to produce

a mean item score for each of the six subscales. The mean item score range for each

subscale was 1 to 4. The subscale items were interspersed within the instrument, and the questions associated with each subscale are enumerated below.

Physical activity. Within this study, the Physical Activity subscale of the HPLP II (Walker et al., 1995) was used to determine the level of physical activity in college freshmen participants. The Physical Activity subscale has eight items, which solicit information about the level, frequency, and duration of physical activity. Items are interspersed within the HPLP II and are represented by question numbers 35, 41, 47, 53, 59, 65, 71, and 77 on the HeLP survey. An example of a physical activity question was, "How often do you exercise vigorously for 20 or more minutes, at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber)?" (Walker et al., 1995).

Nutritional intake. Nutritional intake relates to the consumption of a daily diet, based on the U.S. Department of Agriculture's (2013) Choose My Plate healthy daily intake campaign. The Nutritional Intake subscale of the HPLP II (Walker et al., 1995) solicited information regarding the intake of fruits and vegetables, fats, fiber, dairy, sugar content, whole grains, and prepackaged foods (Walker & Hill-Polerecky, 1996). The Nutritional Intake subscale consisted of nine items that were question numbers 33, 39, 45, 51, 57, 63, 69, 75, and 81 on the HeLP survey. An example of a nutritional intake question was, "How often do you eat 3-5 servings of vegetables a day?" (Walker et al., 1995).

Stress management. Stress Management relates to the use of psychological and physical resources in an effort to control stress and tension through coping strategies and stress-reducing activities (Pender et al., 2006; Walker & Hill-Polerecky, 1996). The

Stress Management subscale of the HPLP II (Walker et al., 1995) was used to measure this variable in the study. The Stress Management subscale comprised eight items, represented by question numbers 36, 42, 48, 54, 60, 66, 72, and 78 on the HeLP survey. An example of a stress management question was, "How often do you balance time between work and play?" (Walker et al., 1995).

Interpersonal relations. Interpersonal relations include the use of communication (both verbal and nonverbal) with other people in an attempt to achieve a sense of intimacy or psychosocial closeness (Walker & Hill-Polerecky, 1996; Walker et al., 1995). The Interpersonal Relations subscale comprised nine items, represented by question numbers 32, 38, 44, 50, 56, 62, 68, 74, and 80 on the HeLP survey. An example of an interpersonal relations question was, "How often do you find it easy to show concern, love and warmth to others?" (Walker et al., 1995).

Spiritual growth. Spiritual growth focuses on the development of inner resources of "transcending, growing, and connecting" (Walker & Hill-Polerecky, 1996, p. 1) to maximize the potential for wellness and working toward purposeful goals relating to a healthy lifestyle (Pender et al., 2006). For this study, the nine-item Spiritual Growth subscale of the HPLP II (Walker et al., 1995) was used for this variable. The Spiritual Growth subscale was represented by question numbers 37, 43, 49, 55, 61, 67, 73, 79, and 83 on the HeLP survey. An example of a spiritual growth question was, "How often do you believe that, 'my life has purpose'?" (Walker et al., 1995).

Health responsibility. Health responsibility involves an active sense of accountability for one's own health through education and health actions, and by following recommendations of health professionals to improve health (Callaghan, 2003;

Walker & Hill-Polerecky, 1996). For this study, the nine-item Health Responsibility subscale of the HPLP II (Walker et al., 1995) was used to measure this variable and was represented by question numbers 34, 40, 46, 52, 58, 64, 70, 76, and 82 on the HeLP survey. An example of a health responsibility item was, "How often do you question health professionals in order to understand their instructions?" (Walker et al., 1995).

Sedentary behavior scale. Sedentary behavior includes activities that are performed in a sitting or lying position and require little physical activity. Sedentary behavior was measured using the six-item SBS, developed by Utter et al. (2003). On the HeLP survey, questions 84 to 89 represented this subscale, which collected data on how many hours were spent on television/video watching, reading and doing homework, and using the computer, unrelated to schoolwork. The first three items requested information about the number of hours spent on sedentary behaviors during the average weekday (Monday through Friday), and the second set of three items asked for the same information, but for the weekend days (Saturday/Sunday). Possible responses for each item included: 1 = none, 2 = ½ hour, 3 =1 hour, 4 = 2 hours, 5 = 3 hours, 6 = 4 hours, 7 = 5+ hours. The grand total for the six items on the SBS was divided by six, with a mean score range of 1 to 7. A higher score represented a higher level of sedentary behavior.

Face and content validity for the SBS (Utter et al., 2003) were supported through a literature review of prior research and content experts' evaluations. A 2-week test–retest of the SBS, with 147 junior-high and high school students, demonstrated correlations for weekday television/video watching ($r = 0.80$), weekend television/video watching ($r =0.69$), weekday computer use, ($r =0.66$), weekend computer use ($r =0.71$), weekday reading/doing homework ($r =0.60$), and weekend reading/doing homework ($r =0.60$).

Data Management

Rigorous data management strategies were employed to avoid inconsistencies in data collection and documentation. After participants consented to participating in the study by signing the consent form and completing the Contact Information Form, the forms were collected by the CI or the RAs and put into a folder for each specific day. The folders stayed in the CI's possession and were securely locked in a file cabinet in the CI's private, locked office as soon as possible after collection.

The information from the consent form and Contact Information Form was entered into an Excel-formatted Study Roster and included the participant name, birth date, assigned study ID number, email address, and phone number. Forms were assessed for completeness prior to being filed. Four participants were contacted by telephone for missing information, two for incomplete birth dates, and two for using their ENMU student ID numbers on the Contact Information Form. Corrected modifications were made to the forms as a result of the telephone conversations.

The Excel Study Roster was stored on the CI's secured, password-protected laptop computer. When the computer was not in the immediate possession of the CI, it was locked in the file cabinet in the CI's locked office each day, as soon as possible after use. Only the CI had access to the Study Roster; this procedure was implemented to maintain participant confidentiality and study integrity.

The HeLP survey form required that one and only one response be entered for each item, with the exception of the question regarding race, for which participants could select one or more responses. The SurveyMonkey system also notified the participant if questions were unanswered when the submit button was pressed. This assisted in

reducing missing data on the survey form. Participants were able to submit the survey, however, even if items were left unanswered.

The completed HeLP survey information was downloaded onto an Excel spreadsheet separately for T1 and T2. The SurveyMonkey system allows transfer of information to an Excel spreadsheet. The spreadsheet information was coded and entered into the SPSS statistical software package (version 16) once all data collection had been completed.

Data Analysis

Prior to data entry, the Excel spreadsheets for T1 and T2 were reviewed visually by the CI for any obvious problems with the data, such as missing data or unusual response patterns. All data were analyzed using the statistical software SPSS (20.0 Graduate Student Version™). The CI entered the data into SPSS and verified that data were entered accurately. Initial frequencies of all variables were examined to assess for outliers and coding errors prior to analysis. Inconsistencies were resolved by comparing entered data with the original surveys. Outliers were assessed graphically using box-plot graphs.

Normality was screened graphically and with Kolmogorov-Smirnov (K-S) testing, and with skewness and kurtosis measures. If the continuous variables departed substantially from a normal distribution, they were re-coded, trimmed, or transformed.

Descriptive Statistics

A table depicting the frequencies, and percentages, of the demographic, categorical variables (gender, race, ethnicity, BMI, and BMI category) was completed.

Display and discussion of the descriptive statistics for the continuous variables, including means, standard deviations, percentages, and ranges, was undertaken as well.

Internal Consistency of Instruments

Cronbach's alpha was calculated to measure the internal consistency reliability of each of the four instruments included in the HeLP: the BSQ (Neuhouser et al., 2009), the SAQ Drinking Patterns subscale (Engs, 2007), the six HPLP II subscales (Walker et al., 1995), and the SBS (Utter et al., 2003). An alpha value of .80 was the minimal acceptable level, since all of these scales had been used previously.

Answering the Research Questions

Following are the research questions, along with the statistical tests that were performed for each question. *For freshmen students, in the first semester of college:*

1. Was there significant weight change in the first semester of college?

To answer this question, either a paired (correlated) *t* test was planned, if the variable was normally distributed, or a Wilcoxon signed-rank test was planned for non-normal distribution. A two-tailed significance value of $< .05$ was required (Burns & Grove, 2009; Green & Salkind, 2008). If the non-parametric test was indicated and results were statistically significant, the parametric test was run solely to determine effect size.

 2. What were the effects of gender, ethnicity, and race on weight change in first-semester college freshmen after controlling for their baseline (T1) BMI category and any change in height from T1 to T2?

Each categorical variable was dummy-coded prior to analysis. First, the BMI categories were collapsed into a dichotomous variable: underweight/normal weight and

overweight/obese. Gender was already dichotomous (male/female), and ethnicity (Hispanic/non-Hispanic), and race (White/Non-White) were dummy-coded as well. T-tests were to be employed if the variables were normally distributed, to determine if there were differences in weight change related to these variables. Mann-Whitney U tests were to be used if the variables were not normally distributed.

If the non-parametric test was indicated and results were statistically significant, the parametric test was run to determine effect size only. Any variable that demonstrated statistical significance was put into a multiple regression model using simultaneous entry, with weight change as the dependent variable.

3. *Did self-reported physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility predict first-semester freshman weight change, after accounting for baseline BMI, height change, gender, ethnicity, and race*?

To answer this question, the bivariate relationship between each of the HeLP variables and weight change was determined, using Pearson's bivariate correlations. Variables that demonstrated statistical significance were entered into the regression model, using simultaneous entry, with the independent variables that demonstrated significance for the second research question. Weight change was entered as the dependent variable.

Answering the hypothesis. It was hypothesized that weight change over the first semester of college was associated with higher levels of sedentary behavior, beverage and snack intake, alcohol consumption, and lower levels of physical activity, good nutritional intake, stress management, interpersonal

relations, spiritual growth, and health responsibility. The relationship between each of the HeLP variables and weight change was reviewed, by examining the Pearson's bivariate correlations for statistical significance.

Exploratory Analysis

An exploratory analysis to evaluate if there was a significant difference in the BMI from T1 to T2 was planned to be assessed with paired (dependent) t-tests, if there was normal distribution of the variables. If the distribution of the difference scores was not normal, Wilcoxon signed ranks tests were to be used. If the non-parametric test was indicated, and results were statistically significant, the parametric test was used to determine effect size only. In addition, the same predictors (except for change in height) were used to predict change in BMI from Time 1 to Time 2.

T-tests or Mann-Whitney tests were used, based on distribution of the difference scores, to determine if there were differences in BMI change related to BMI category, gender, ethnicity, or race. Each categorical variable was dummy-coded prior to analysis as discussed previously. If the non-parametric tests were used and results were statistically significant, the parametric test was used, solely to determine effect size.

Pearson's bivariate correlations were conducted to determine if there was a relationship between BMI change , weight change, and change for each of the HeLP IVs (except for height change) at T1. To answer which independent variables predicted BMI change, a multiple regression, using simultaneous entry, was conducted with the dependent variable, BMI change, and those IVs with significant relationships with BMI.

A second exploratory analysis was also performed to evaluate differences in the measures of physical activity, sedentary behavior, nutritional intake, beverage and snack

intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility from T1 to T2 was assessed with either paired (dependent) t-tests or Wilcoxon signed ranks tests, based on the distribution of the variables. A two-tailed significance value of <.005 was used to maintain a familywise significance level of $p < .05$ for these nine comparisons. If non-parametric tests were indicated and results were statistically significant, t-tests were run to determine effect size.

Protection of Human Subjects

Risks to the Subjects

Human subject involvement and characteristics. The study population was composed of freshman students at a Southwestern public university**.** All freshmen who met the inclusion criteria were invited to participate in the research study. Fifteen Freshman Seminar courses were used for recruitment. Inclusion criteria for participants included college freshmen between the ages of 18 and 19 years who lived in college dormitories and purchased the cafeteria meal plan; could write, speak, and read English fluently; and were enrolled in the fall 2011 semester as their first semester at a college or university. Exclusion criteria included students who attended college previously, lived in campus housing previously, did not live in freshman-designated dormitory housing, did not purchase the cafeteria meal plan, had children, were pregnant, were married, or were 20 years of age or older at T1.

Students who agreed to participate were required to complete a Contact Information Sheet, sign the consent form, and have their heights and weights measured at the beginning (T1) and end (T2) of the fall semester. The online HeLP survey was also

completed at T1 and T2. Students were notified that they could withdraw from the study at any time, with no academic or other consequences.

After the study was approved by the UNM HRPO, the CI approached the instructors of the Freshman Seminar classes to request their permission to allow student participation in the study. The CI then explained the study purpose, aims, inclusion and exclusion criteria, methods, and data collection procedures. A purposive sampling strategy was employed, recruiting eligible freshmen from the 29 course sections of Freshman Seminar.

Potential participants were apprised of the study purpose, inclusion and exclusion criteria, and data collection procedures. Students who did not wish to participate or who did not meet the inclusion criteria left the orientation session and returned to class. As previously noted, consent forms and Contact Information Forms from voluntary participants were obtained at this meeting. A nominal $10 Visa™ gift card was provided to each participant at the conclusion of the study as an incentive for completing the study components at T1 and T2.

Sources of materials. No physiological specimens were obtained for use in this study. The self-administered, 89-item web-based survey was administered on two different occasions, at the beginning of the freshman fall semester in 2011 (T1) and at the end of the fall freshman semester (T2). Topics on the survey included gender, race/ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility.

The SurveyMonkey web portal was accessible from any computer with Internet access. Participants were required to enter the assigned study ID number to access the HeLP survey. Participants were only able to see their own survey; the only information that was viewable by all students was a copy of the consent form.

The CI and up to four RAs were present during the T1 data collection times, when the participants signed the consent forms and completed the participant Contact Information Forms. The CI and four RAs collected the height and weight measures at T1 and T2. The CI was present at all sessions, whereas the RAs rotated at the height and weight collection sessions, with one to four RAs present at the sessions.

The data from the height/weight measures and the survey results were only identified on the Excel spreadsheets by the assigned study ID number. The study ID number provided the link between the data collected through the self-administered, online survey and the height/weight measures at T1 and T2 for each participant. Names or other readily identifiable information about study participants were not on the data collection spreadsheets.

Potential risks. The risks to participants were minimal, with no greater risks than those experienced in performing regular activities in everyday life. There was a small risk of loss of confidentiality, because the surveys and height and weight measures were collected at two different times and were linked to specific participants.

An Event Form was filed with the UNM HRPO on November 28, 2011, when it was discovered by the CI that she had inadvertently sent the full list of participant email addresses to all study participants via email during a mail merge procedure. No other identifying information, other than the topic of the email, "Research study-Weight

Change in College Freshmen," was contained in the email. No remedial action was advised by the HRRC. All emails after this event were sent individually to each participant to prevent further release of protected information.

There was also a risk of loss of privacy. Privacy screens were present between the two height/weight measuring stations to prevent other participants from inadvertent viewing of the height/weight procedures. Even with these precautions, some participants may have been embarrassed or uncomfortable about the weight process or may not have wanted to divulge lifestyle behaviors fully, particularly if they were overweight, had an eating disorder, or had a poor body image. For those participants, participation could have caused emotional distress.

Protection against risk. No participants demonstrated discomfort or distress at any time during the study. It they had, they would have been given the option to withdraw immediately from the study, and a referral to the university counseling center would have been made available to the participant. Counseling services are provided to all students at no charge. The CI, a family nurse practitioner with more than 16 years of clinical experience, was present whenever direct contact was made with the participants and was available to address participant questions or concerns relating to the study.

In addition, contact information for the CI was shown on the Study ID Card provided to each participant. A copy of the consent form was also provided to each participant and was linked to the HeLP survey, so that participants could review the consent form before completing the survey at both T1 and T2.

To protect privacy and confidentiality, only the study ID number was used on the data collection forms as the participant identifier to protect the participants' identities.

The surveys were accessed through the SurveyMonkey web system, and the study ID

number was the only participant identifier present.

All forms and data related to the study were secured in a locked file cabinet in the

CI's private office. In addition, when the CI was not in the office, the outer door to the

office was also locked. Data files related to the study located on the CI's computer were

password protected, and only the CI or designated RAs in the presence of the CI had

access to these files.

Potential benefits. Because this was an exploratory study, there were no specific

benefits to being enrolled in the study. Among the potential benefits were that

participants might reap satisfaction knowing that participation might provide knowledge

in future studies that might give rise to interventions that will assist other college students

in obtaining and maintaining a healthy weight.

Chapter 4

RESULTS

The purpose of this study was to determine the personal, interpersonal and situational variables that predicted significant weight change of first semester freshmen within the university environment. This chapter presents the demographic characteristics of the participants and a description of the major study variables. Next, analysis for the three research questions, and related hypothesis, are presented. In addition, the two exploratory analyses were undertaken. All analyses were conducted using IBM SPSS Statistics, version 20.0, to evaluate all assumptions and to derive the findings discussed in this chapter.

Demographic Characteristics

Participants were recruited from a Southwestern public university in the fall semester of 2011. Data collected included height, weight, and the on-line HeLP survey at both T1 (weeks 2-3 of the semester) and T2 (weeks 14-16 of the semester). At T2, there were 76 remaining participants with complete data from the original 90 at T1 (15.6% attrition rate from T1). Table 5 displays, and compares, the demographic characteristics of the participants with complete data at T1 (n= 90) and T2 (n = 76), with the demographic information provided for the entire entering freshman class in fall 2011 (n = 689).

Table 5. *Demographic Information: Comparison of Entire Entering Freshman Class with All Participants at T1 and Participants Completing Study at T2*

Demographic Characteristic	Entire Class (N = 689)[a]	T1 Participants (N = 90)	Participants Completing Study at T2 (N = 76)
Gender, n (%)			
Male	344 (48.5%)	40 (44.4%)	31 (40.8%)
Female	355 (51.5%)	50 (55.6%)	45 (59.2%)
Ethnicity, n (%)			
Hispanic/Latino	255 (37.1%)[b]	29 (32.2%)	28 (36.8%)
Non-Hispanic/Latino	434 (62.9%)[b]	61 (67.8%)	48 (63.2%)
Race, n (%)			
Black/African American	39 (5.7%)	10 (11.1%)	10 (13.2%)
American Indian/ Native Alaskan	24 (3.6%)	7 (7.8%)	5 (6.6%)
Native Hawaiian/ Pacific Islander	0 (0%)	0 (0.0%)	0 (0.0%)
White	304 (44.1%)	55 (61.1%)	45 (59.2%)
Asian	2 (0.03%)	2 (2.2%)	2 (2.6%)
Unknown/Other	45 (6.5%)	12 (13.3%)	10 (13.2%)
More than one race	20 (3.0%)	4 (4.4%)	4 (5.3%)
White/Non-White Race Recode, n (%)			
White	Not available	55 (61.1%)	46 (60.5%)
All others	Not available	35 (38.9%)	30 (39.5%)

[a]Column content obtained from ENMU, 2012

[b]For the entire class data, ethnicity and race were not reported separately (ENMU, 2012).

Gender, Ethnicity, and Race

Upon review of the demographic information, a higher percentage of females (59.2%) than males (40.8%) completed the study, at a wider margin than the gender composition of the entire entering freshman class (51.5% females, males 48.5%) (Table 5). The percentages of Hispanics/non-Hispanics in the entire class and at the completion of the study were very similar, as were the percentages for *more than one race*, and *Asian* participants. In addition, the percentages of *Black/African Americans, American Indian/Native Alaskans, Whites*, and *Unknown/Other* races were much higher for study

participants than in the entire class. Overall, there were minimal differences in gender, race, and ethnicity between the participants with complete data at T1 and, again, at the completion of the study.

Weight and Weight Change

There was a 0.5 pound difference between the participants who began the study at T1 (N= 90, M= 157.4, SD= 45.1) and those who completed the study (n= 76, M= 156.9, SD= 46.2; Table 6). For those who completed the study, there was a mean weight change of 2.3 pounds (n= 76, SD= 7.4) at T2.

Table 6. *Weight, BMI, and BMI Category at Baseline among all Participants at T1 and among Participants Who Completed the Study*

	Baseline (T1): All Enrolled Participants (*N*=90)	Baseline (T1): Participants who Completed Study (n=76)	T2: Participants who Completed Study (n=76)
Weight (lbs): mean (*SD*)	157.4 (45.1)	156.9 (46.2)	159.2 (43.6)
Weight ∆: mean (*SD*)	N/A	N/A	2.3 (7.4)
Clinically Significant Weight gain, *n* (%)			
< 3.5 lbs	N/A	N/A	43 (56.6%)
≥ 3.5 lbs	N/A	N/A	33 (42.3%)
BMI: mean (*SD*)	24.6 (6.3)	24.5 (6.5)	24.9 (6.0)
BMI ∆: mean (*SD*)	N/A	N/A	0.4 (0.2)
BMI Category, *n* (%)			
Underweight/normal	60 (66.7%)	52 (68.5%)	49 (64.5%)
Overweight	17 (18.9%)	15 (19.7%)	18 (23.7%)
Obese	13 (14.4%)	9 (11.8%)	9 (11.8%)

Clinically Significant Weight Gain

A categorical variable was developed to reflect the number and percentage of participants who gained a clinically significant amount of weight ($\geq$ 3.5 pounds), compared to those whose gained less than 3.5 pounds, or lost weight (Table 6).   Thirty-three (42.3%) of all participants gained clinically significant weight gain. Eight (9.5%)

gained between 3.5 and 5.0 pounds, 14 (18.4%) gained between 5.1 and 10.0 pounds, 9

(11.8%) gained 10.1 and 15.0 pounds, and 2 (2.6%) gained > 15 pounds (Figure 2).
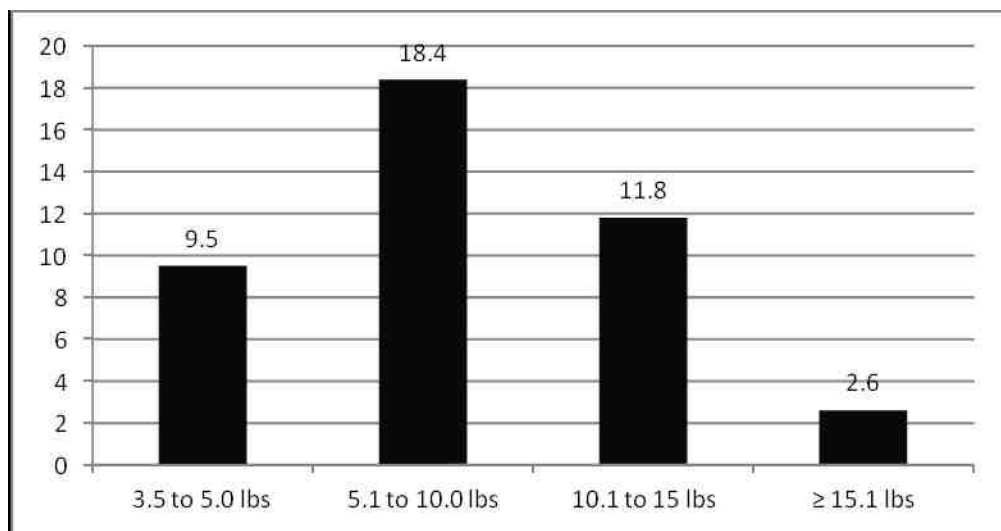
Figure 2. Percent of participants experiencing clinically significant weight gain
(≥3.5 pounds); n= 33/76.

BMI and BMI Change

Participant BMIs ranged from 13.0 (with one underweight participant), to 45.6,

with two participants being morbidly obese ($\geq$ 40.0 kg/m^2). The initial BMI mean was

very similar for participants at the baseline at T1 (*n*= 90) and for those who completed the

study (*n*= 72; Table 6). For those participants who completed the study at T2, there was a

mean increase in the BMI of 0.4 (*n*= 76, *SD*= 0.2).

BMI Categories

Examination of the BMI categories between the participants at T1 (n =90) and the

participants who completed the study at T2 (n=76) demonstrated that the

underweight/normal and overweight participants were similar. However, there was a

decrease in the number and percentage of participants in the obese category, from 13

(14.4%) to nine (11.8%) from the baseline at T1 (*n*= 90) and for those who completed the

study (*n*= 76) (Table 6). In addition, for those who completed the study at T2 (n= 76), there was a mean increase of three participants moving from the underweight/normal BMI category to the overweight BMI category, due to weight increase.

In the participants in the underweight/normal BMI category, there was a mean weight increase of 3.6 pounds. In the overweight BMI category group, there was a mean increase of 2.6 pounds, and for those in the obese BMI category, there was a decrease in weight of 4.2 pounds (Figure 3). Additionally, 50% (26/52) of those in the underweight/normal BMI category gained clinically significant weight ($\geq$ 3.5 pounds), as well as 33.3% (5/15) of those in the overweight group and 22.2% (2/9) of those in the obese group.
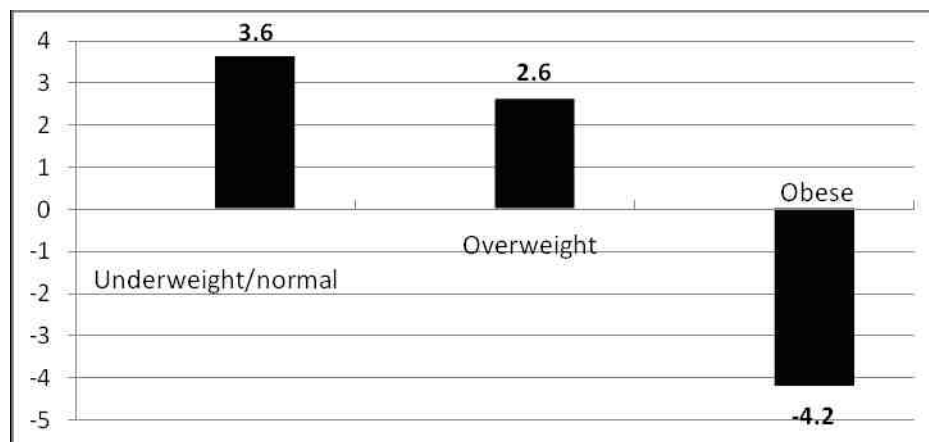
Figure 3. Average weight change (pounds), based on BMI category, from T1 to T2 (*n*= 76)

Description of ContinuousVariables at T1

The continuous variables in this study included beverage and snack intake, alcohol consumption, physical activity, nutritional intake, stress management, interpersonal relations, spiritual growth, health responsibility, and sedentary behavior. Table 7 displays the descriptive statistics for the continuous variables at T1, and includes

the means, standard deviation (*SD*) and ranges (minimum and maximum) observed and

quartiles for the questionnaire instruments.

Table 7. *Summary of Continuous Variables/Scale Descriptives at T1*

Scale/Variable	N	# of Items	Mean(SD)	Range Min./Max	Quartiles 25	50	75
Beverage and Snack Questionnaire at T1[a]	68	19	4.1 (.44)	3.2 / 5.0	3.8	4.0	4.3
SAQ-Drinking Patterns Subscale at T1[b]	74	6	4.6 (.58)	2.5 / 5.0	4.3	4.9	5.0
HPLP II at T1[c] Total	70	52	2.5 (.40)	1.0 / 4.0	2.2	2.5	2.8
Physical Activity	71	9	2.5 (.59)	1.3 / 4.0	2.1	2.3	3.1
Nutrition	70	9	2.4 (.46)	1.3 / 3.4	2.0	2.3	2.8
Stress Management	72	8	2.6 (.45)	1.5 / 3.5	2.3	2.5	2.9
Interpersonal Relations	73	9	3.0 (.56)	1.7 / 4.0	2.6	3.1	3.4
Spiritual Growth	70	9	3.2 (.50)	1.8 / 4.0	2.9	3.2	3.4
Health Responsibility	72	8	1.9 (.50)	1.0 / 3.6	1.5	1.9	2.3
Sedentary Behavior Scale at T1[d]	73	6	4.6 (.98)	2.7 / 7.0	3.5	4.2	5.0

[a]Neuhouser et al., 2009. [b]Engs, 2007. [c]Walker et al., 1995. [d]Utter et al., 2003.

Beverage and Snack Questionnaire at T1

Beverage and snack intake was measured using the BSQ, which included 19

questions about snack foods and beverages, with both healthy and unhealthy choices

listed (Neuhouser et al., 2009). The root question was, "Over the past week, how many

times did you eat (or drink) the following?" Possible response choices for each item were

1 (never/less than once per week), 2 (once per week), 3 (two to four times per week), 4

(five to six times per week), 5 (once per day), 6 (two to three times per day), and 7 (four

or more times per day). Higher scores indicated less healthy eating. The mean of 4.1,

with a range of 3.21 – 4.95 indicated that generally, participants made unhealthy

beverage and snack choices on an almost daily basis. Thirty participants (44.1%) scored

between 3 and 4; while 38 participants (55.9%) scored between 4 and 5.

SAQ-Drinking Patterns Subscale at T1

A six-item subscale of the SAQ was used in this study (Engs, 1977; 2007). Three

items ask about the frequency of alcohol intake: "How often, on average, do you usually

have a beer/wine/liquor or spirits (e.g., whiskey, gin, vodka, mixed drinks)?" Responses

include: 1 (every day), 2 (at least once a week, but not every day), 3 (at least once a

month, but less than once a week), 4 (more than once a year but less than once a month),

or 5 (once a year or less/never). The other three items ask about the quantity of alcohol

consumed: "When you drink beer (wine or liquor or spirits), how much, on average, do

you usually drink at any one time?" The response set includes: 1 (over six), 2 (five or

six), 3 (three or four), 4 (one or two), or 5 (less than one/none; Engs, 2007). The higher

the frequency of alcohol consumption and the greater the number of alcoholic drinks

consumed on each occasion, the lower the number on the SAQ (Engs, 2007).

The scores on the SAQ ranged from 2.5 to 5.0, with a mean of 4.6, indicating rare

alcohol intake, and frequency of alcohol intake, for the majority of participants. No

participant reported drinking on a daily basis (response 1); however, five participants

(6.8%) had extreme values for this cohort, with mean scores of 2.5 to 3.2, which

indicated a larger amount of alcohol consumed, or increased frequency, than the average

participant in this study.

HPLP II at T1

  The HPLP II is a 52-item survey with six subscales, and was used to measure the variables of physical activity (8 items), nutritional intake (9 items), stress management (8 items), interpersonal relationships (9 items), spiritual growth (9 items), and health responsibility (9 items; Walker et al., 1995). Response choices for all items on the HPLP II subscales ranged from 1 to 4: 1 = never, 2 = sometimes, 3 = often, and 4 = routinely. For each of the six subscales, responses were summated, then divided by the number of items per subscale, to produce a mean subscale score for each of the six subscales. Higher scores indicated increased frequency of healthy behaviors.

  Total HPLP II scale at T1. The mean score for the six subscales, the total HPLP II, was 2.5 (*SD*=.40, range 1.7 to 3.6), indicating that overall, the study participants performed moderately healthy behavior. Overall, nine participants (12.3%) had a mean score between 1.0-1.9, "never to sometimes"; 56 participants (76.7%) had a mean score of 2.0 to 2.9, "sometimes to often"; and eight participants (11.0%) had a mean score of 3.0-3.9, "often to routinely". No participants had a mean score of 4.0, "routinely", for the six subscales.

  Physical activity at T1. The mean Physical Activity score in this study was 2.5 (*SD* = 0.59, range 1.3 to 4.0), which indicated that participants were moderately physically active. Eleven participants (15.5%) reported that they "never to sometimes" participated in physical activity, with 20 participants (28.2%) indicating that they participated in physical activity "often to routinely".

  Nutrition at T1. The mean Nutrition subscale score was 2.4 (*SD* =.46, range 1.3 to 3.4) indicating that, overall, participants had moderately healthy eating habits. Forty-

seven participants (88.6%) indicated healthy nutritional intake "sometimes-to-often".

However, 15 participants (21.4%) stated that they "never to sometimes" had healthy

nutritional intake, with only eight participants (11.4%) practicing healthy eating habits,

"often to routinely".

Stress management at T1. The mean Stress Management subscale score was 2.6

(SD = .45, range 1.5 to 3.5). The vast majority, 54 participants (75.0%) reported

practicing stress management skills "sometimes to often"; an additional 15 participants

(20.8%) reported performing stress management practices "often to routinely".

Interpersonal relations at T1. The subscale of healthy interpersonal relations

had one of the highest means for the HPLP II of 3.0, "often to routinely", indicating

strong and healthy interpersonal relations overall. Twenty-four participants (32.9%) had

a mean subscale score of 2- "sometimes to often", with 48 participants (61.6%)

experiencing healthy interpersonal relations "often to routinely".

Spiritual growth at T1. The subscale of spiritual growth had the highest mean

for the HPLP II at 3.2, indicating strong spiritual inner resources and the ability to grow

spiritually. One participant (1.4%) had a mean score of 1.8, which was an extreme value

for this subscale ("never to sometimes"), with 17 participants (24.3%) having a mean

subscale score of 2, experiencing spiritual growth "sometimes to often". However, the

vast majority, 74.3 %, indicated experiencing spiritual growth "often to routinely", with

52 participants having a mean subscale score of 3 -4 on this subscale.

Health responsibility at T1. The subscale of health responsibility had the lowest

mean, 1.9, for the subscales of the HPLP II. On average, 71 participants (97.2%)

"sometimes" took responsibility for their health. Only two participants (2.8%) had a

mean subscale score of "often to routinely".

Sedentary Behavior Scale at T1

Sedentary behavior was measured using the six-item SBS, developed by Utter et

al. (2003). Participants were queried on how many hours were spent television/video

watching, reading and doing homework, and using the computer in activities unrelated to

schoolwork. Possible responses for each item included: 1 = none, 2 = ½ hour, 3 =1 hour,

4 = 2 hours, 5 = 3 hours, 6 = 4 hours, 7 = 5+ hours. The final scale score is the mean

score for the summated six items. A higher score represented a higher level of sedentary

behavior. The mean for the scale was 4.6 (*SD* = .98, range 2.7 to 7.0), or an average of 2-

4 hours per day being spent on sedentary behaviors. Sixty-six participants (90.3%) had

mean scores between 3.0 and 5.9.

Normality at T1

Normality was assessed for the study variables at T1 with assessment of normality

plots, the Kolmogorow-Smirnov test (K.S.); skewness (skew) with the standard error

(*S.E.*) and z-score; and kurtosis (kurt) with the standard error (*S.E.*) and z-score. Outliers

were reviewed for all continuous variables on box-plots to confirm that the values were

entered correctly. When the output for outliers was reviewed, an error was found on data

entry of a participant's BMI at T2 and this was corrected.

In addition, one participant was identified with extreme outliers on the box-plots

for weight at T1 and T2, BMI at T1 and T2, and change in weight. Field (2005)

recommends a remedy to bring an extreme outlier closer to the mean, which is to adjust

the value to one unit greater than the next highest value in the data set. This was

performed for the five variables in question. This action improved the standard deviation, skewness and kurtosis for these variables, but the K-S was still significant for each, indicating that the variables did not approach normal distribution. Therefore, the original, unadjusted information was used for data analysis. Upon assessment of the normality of the continuous variables at T1, only two variables were determined to approach normal distribution: HPLP II total and the SBS.

Scale Reliability

Internal consistency reliability was assessed for the scales at both T1 and T2, by examining the Cronbach's alpha values (see Table 8). Since all of the instruments were used in prior studies, a Cronbach's alpha of .80 was sought.

Table 8: *Internal Consistency Reliability for Scales at T1 and T2*

Scale/Variable	Cronbach's alpha- T1	Cronbach's alpha- T2
Beverage and Snack Questionnaire at T1[a]	.60	.50
SAQ-Drinking Patterns Subscale at T1[b]	.78	.78
HPLP II at T1[c]		
Total	.92	.94
Physical Activity	.77	.82
Nutrition	.67	.68
Stress Management	.65	.72
Interpersonal Relations	.83	.83
Spiritual Growth	.83	.88
Health Responsibility	.80	.88
Sedentary Behavior Scale at T1[d]	.66	.64

[a]Neuhouser et al., 2009. [b]Engs, 2007. [c]Walker et al., 1995. [d]Utter et al., 2003.

Beverage and Snack Questionnaire (BSQ)

In this study, the Beverage and Snack Questionnaire had very low Cronbach's alpha measures at .60 at T1 and .50 at T2. Upon review of the reliability analysis to see if the coefficient alpha would be improved if any item was deleted, the Cronbach's alpha did not improve for either the T1 or T2 administration of the scale. Therefore, in this study, the BSQ did not demonstrate acceptable reliability at either T1 or T2.

SAQ-Drinking Patterns Subscale

Internal consistency reliability was also assessed on the SAQ subscale. The SAQ subscale approached, but did not meet, the desired reliability coefficient of $\geq .80$ at both T1 and T2 (0.78 on each administration).

HPLP II

Within this study, at both T1 and T2, the HPLP II Cronbach's alpha coefficients for the Total scale, Interpersonal Relations, Spiritual Growth, and Health Responsibility subscales met the threshold set for an acceptable internal consistency of .80 at T2. The Physical Activity subscale, Nutrition subscale and Stress Management subscale at T1, and Nutrition subscale at T2, all had Cronbach's alpha coefficients below the preferred threshold of 0.80. For these subscales, at T1 and T2, elimination of any item did not improve the overall coefficient alphas.

Sedentary Behavior Scale (SBS)

The SBS has a low internal consistency (Cronbach's alpha reliability of .66 at T1 and .64 at T2). Upon review of the reliability scale/item deleted analysis, it was found that the scale's coefficient alpha, at T1 and T2, would not have been improved if any single item were deleted.

Research Questions- Results

Data analysis was performed to answer the three research questions, hypothesis, and to conduct the exploratory analysis. Since most continuous variables and scales were not normally distributed, with a moderate-sized sample (76 participants), non-parametric statistics were performed. When significant results were obtained with the non-parametric testing, the equivalent parametric testing was performed so that effect sizes could be calculated for significant findings. The original proposed analyses also included use of multiple regression and 14 predictors (Research Questions #2 and #3). Since the planned sample of 135 participants was not obtained for the study, this limited the number of predictors that could be entered into the regression equation to three.

Research Question #1: Significant Weight Change

To answer the first research question: *Was there significant weight change in the first semester of college*, weight in pounds (to the nearest 0.1 pound) was measured at T1 and T2. The change in weight ranged from an increase in weight of 22.2 pounds, to a decrease in weight of 26.0 pounds, over the first semester of college, with a mean increase of 2.3 pounds (see Table 6).

A Wilcoxon signed-rank test was performed to determine if there was a statistically significant weight change from T1 to T2 in the first semester of college. A statistically significant difference was found between T1 (*Mdn.*= 148.40) and T2 (*Mdn.*= 152.50) on the Wilcoxon signed-rank test, with a mean increase in weight of 2.3 pounds (n= 76, $p \leq .01$) over the first semester of college. Since the Wilcoxon signed-rank test was statistically significant, a t-test was performed to estimate the effect size. The t-test also demonstrated a statistically significant increase in weight from T1 (*M*=156.9,

SD=46.21) to T2 (*M*=159.2, *SD*=43.55, *t*(75)= -2.26, *p* < .01). The eta squared statistic

(.09),indicated a moderate effect size, according to Cohen's guidelines (Pallant, 2005).

Research Question #2: Analysis of Proposed Covariates and Weight Change

The second research question was: What were the effects of gender, ethnicity, and

race on weight change in the first semester college freshmen after controlling for the

baseline (T1) BMI categories and any change in height from T1 to T2?

BMI categories and weight change. A Mann-Whitney test was performed to

determine if there were significant differences between the BMI categories related to

weight change. The overweight and obese BMI categories were combined, since this

would be how the variable was entered into the regression model (dummy-coded as a

dichotomous variable). The test result was not significant between the two groups:

underweight/normal *(Mdn* = 3.40); overweight/obese (*Mdn* = 0.00), *U* = 464.5, *z* = -1.78,

p = .07. Although the alpha statistic approached significance, it did not meet the criterion

alpha level of ≤.05.

However, it was important, theoretically, to control for this variable before

estimating other effects in the regression model tested in Research Question #3, because

the baseline BMI categories varied between those who completed the study (*n*= 76), and

the entire enrolled sample at T1 (*n*= 90), with four participants (2.6%) in the obese group

dropping out of the study. Therefore, the dichotomous BMI category variable was

included in the regression model (Research Question #3).

Height change and weight change. There was a mean increase in height, from

T1 to T2 , of 0.13 inches, from 66.80 inches to 66.93 inches, and the median increased

from 66.62 to 66.88 (0.25 inches). It was determined that the change in height was too

small for paired significance testing. Additionally, it was determined that the small measures of height change would have minimal impact on any observed weight change, so it was not entered into the regression model.

Effects of gender, ethnicity, and race on weight change. Mann-Whitney tests were used to determine if there were differences in weight change related to gender, ethnicity, or race. Each categorical variable was dummy-coded prior to analysis. The Mann-Whitney test for gender showed no statistically significant difference in weight change between females *(Mdn* = 3.0) and males (*Mdn* = 0.8), *U* = 644, *z* = -.57, *p* = .57. In addition, there was not a significant difference based on ethnicity, between non-Hispanic (*Mdn* = 1.1) and Hispanic participants (*Mdn* = 3.2), *U* = 579.5, *z* = -.99, *p* = .32). There was also no significant difference in weight change between White (*Mdn* = 1.5) and Non-White participants (*Mdn* = 2.7), *U* = 639.5, *z* = -.54, *p* = .59. Since the statistical testing was not significant for the dichotomous variables of gender, ethnicity and race, parametric testing was not performed to determine effect size, and these variables were not entered into the regression model.

Research Question #3: HeLP Questionnaire Scales and Weight Change

In order to determine the significant IVs for the regression equation to answer Question #3: *Did self-reported physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility predict first-semester freshman weight change after accounting for baseline BMI, height change, gender, ethnicity, and race*, the bivariate relationship between each of the HeLP variables and weight change was determined, using Pearson's bivariate correlations (see Table 9). Prior to performing

these correlations, scatterplots were developed to visually examine whether or not each of the hypothesized independent variables had a direct, one-to-one relationship with the dependent variable, weight change. On the scatterplots, HPLP II Health Responsibility subscale and the HPLP II total scale at T1 appeared to have the strongest linear relationships with the dependent variable, weight change.

   Pearson's correlation testing. Pearson bivariate correlations were performed to determine if there were significant linear relationships between weight change and the HeLP scales and subscales (Table 9). Only the HPLP II Health Responsibility subscale at T1 ($r = -.26$, $p = .03$) revealed a significant, but small, relationship with weight change; the shared variance for the Health Responsibility subscale and weight change was 6.5%. This was an inverse relationship, as the level of health responsibility decreased, weight increased. Since the correlation was significant, the HPLP II Health Responsibility subscale was entered into the regression equation.

Table 9. *Pearson's Correlations of Continuous Variables and Weight Change*

Independent Variable		Weight Change
BSQ at t1	Pearson Correlation	.15
	Sig. (2-tailed)	.23
	N	68
SAQ subscale	Pearson Correlation	-.14
	Sig. (2-tailed)	.22
	N	.74
HPLP Total at T1	Pearson Correlation	-.14
	Sig. (2-tailed)	.23
	N	70
		.
HPLP Physical Activity subscale at T1	Pearson Correlation	.02
	Sig. (2-tailed)	.85
	N	71
HPLP Nutrition subscale at t1	Pearson Correlation	-.08
	Sig. (2-tailed)	.51
	N	70
HPLP Stress Management subscale at T1	Pearson Correlation	.02
	Sig. (2-tailed)	.89
	N	72
HPLP Interpersonal Relations Subscale at T1	Pearson Correlation	-.11
	Sig. (2-tailed)	.37
	N	73
HPLP Spiritual Growth Subscale at T1	Pearson Correlation	-.18
	Sig. (2-tailed)	.15
	N	70
HPLP Health Responsibility Subscale at T1	Pearson Correlation	-.26
	Sig. (2-tailed)*	.03
	N	72
SBS at T1	Pearson Correlation	.09
	Sig. (2-tailed)	.43
	N	73

*Correlation is significant at the 0.05 level (2-tailed)**.**

Multiple regression- Weight change. To answer which independent variables predicted weight change in the first semester of college for freshmen, a standard multiple regression was conducted with the dependent variable, weight change, and two IVs that demonstrated significant relationships to the DV, the Health Responsibility subscale at T1 and the dummy coded BMI categories at T1. Group 1- underweight/normal being was coded as "0" (*n*= 52) , and Group 2-overweight and Group 3- obese was collapsed into one category and coded as "1" (n= 24). The IVs were entered into the regression equation in a single block. A summary of the regression coefficients is presented in Table 10.

The assumptions of linear relationships, collinearity diagnostics, and homoscedasticity were evaluated for the dependent variable, weight change, and the two IVs, BMI categories and the HPLP II Health Responsibility subscale. The assumptions of linearity, independence of errors, homoscedasticity, and normality of residuals were met.

Table 10. *Final Regression Model- Weight Change*

	B	**SE(B)**	**Beta**	*t*	*p*
Constant	9.10	3.01		3.02	≤.001
BMI Categories- T1	-4.06	1.82	-.26	-2.23	.03
HPLP II Health Responsibility- T1	-3.09	1.55	-.22	-2.00	.05

The regression results indicated an overall model of the two predictors (Health Responsibility subscale and BMI categories, both at T1), which significantly predicted weight change, R^2= .14, Adj. R^2=.12, $F(2,69,)$= 5.70, $p \leq$.001. This model accounted for 12.0% of variance in weight change. Of the two predictors in the model, only Health Responsibility (after controlling for BMI category) was statistically significant. On

average, after controlling for baseline (dichotomized) BMI category, a 1 category difference in Health Responsibility at Time 1 (e.g., from an average score of 1[never] to 2 [sometimes]) was associated with approximately a three pound change in weight by Time 2. The relationship was negative, so higher levels of health responsibility were associated with a decrease in weight, and lower levels with an increase in weight.

Hypothesis testing. It was hypothesized that weight change over the first semester of college was associated with higher levels of sedentary behavior, beverage and snack intake, alcohol consumption, and lower levels of physical activity, good nutritional intake, stress management, interpersonal relations, spiritual growth, and health responsibility. Through non-parametric and parametric testing, it was determined that weight change in the first semester of college had an inverse relationship with two factors, health responsibility and BMI categories. The lower the level of health responsibility, the greater the increase in weight. Additionally, as previously discussed, those participants who were in the lowest BMI category (1-underweight/ normal) had the largest gain in weight.

Descriptions of Continuous Variables at T2

Exploratory analyses were completed to evaluate if there was a significant difference in the BMI from T1 to T2, to determine if the IVs (except for change in height) predicted the change in BMI, and to evaluate bivariate differences in the measures of physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility from T1 to T2.

To perform the exploratory analyses, descriptions and normality of the continuous variables at T2 were reviewed. The T2 variables included beverage and snack intake, alcohol consumption, physical activity, nutritional intake, stress management, interpersonal relations, spiritual growth, health responsibility, and sedentary behavior. Height at T2, weight at T2, and BMI at T2 were described in Tables 6 and 7. Table 11 displays the descriptive statistics for the instrument scales at T2, and includes the means, standard deviation (SD) and ranges (minimum and maximum) observed and possible range of values for the questionnaire instruments.

Table 11. *Summary of Continuous Variables/Scale Descriptives at T2*

Scale/Variable	N	# of Items	Mean(SD)	Range Min./Max	Quartiles 25	50	75
Beverage and Snack Questionnaire at T1[a]	64	19	4.0 (.36)	3.2 / 4.8	3.9	4.0	4.4
SAQ-Drinking Patterns Subscale at T1[b]	73	6	4.4 (.66)	2.5 / 5.0	3.9	4.5	5.0
HPLP II at T1[c] Total	69	52	2.5 (.50)	1.0 / 4.0	2.3	2.5	2.8
Physical Activity	71	9	2.5 (.60)	1.4 / 4.0	2.0	2.4	2.9
Nutrition	71	9	2.3 (.47)	1.6 / 4.0	2.0	2.3	2.6
Stress Management	72	8	2.6 (.51)	1.6 / 4.0	2.3	2.6	2.9
Interpersonal Relations	71	9	3.1 (.54)	1.9 / 4.0	2.7	3.1	3.4
Spiritual Growth	72	9	3.2 (.56)	1.4 / 4.0	2.9	3.3	3.7
Health Responsibility	69	8	2.1 (.62)	1.0 / 3.8	1.6	2.0	2.4
Sedentary Behavior Scale at T1[d]	74	6	4.5 (.98)	2.7 / 7.0	3.8	4.5	5.3

[a]Neuhouser et al., 2009. [b]Engs, 2007. [c]Walker et al., 1995. [d]Utter et al., 2003.

Beverage and Snack Questionnaire at T2

Beverage and snack intake was measured using the BSQ, which included 19 questions about snack foods and beverages, with both healthy and unhealthy choices

listed (Neuhouser et al., 2009). The root question was, "Over the past week, how many times did you eat (or drink) the following?" Possible response choices for each item were 1 (never/less than once per week), 2 (once per week), 3 (two to four times per week), 4 (five to six times per week), 5 (once per day), 6 (two to three times per day), and 7 (four or more times per day). The higher the score, the less healthy was the snack or beverage choice. The mean of 4.0 (five- six times per week), with a range of 3.26 – 4.84, indicated that, overall, participants made unhealthy beverage and snack choices on an almost daily basis. These findings were very similar to those found at T1 for this instrument.

SAQ-Drinking Patterns Subscale at T2

The scores ranged from 2.5 to 5.0, with a mean of 4.4, indicating rare alcohol intake for the majority of participants. The mean was similar to that at T1 (4.6); however, 10 more participants (13.7%) indicated that they drank alcohol at least once a month when compared with the results at T1, and there were six more participants (8.2%) indicating that they had consumed alcohol over the fall semester. Overall, there was an increase in alcohol consumption and frequency of intake; the number of students who reported drinking alcohol increasing by 7.5% (from 50.0% to 57.5 %) by the end of the semester.

HPLP II at T2

The HPLP II (52-item survey with six subscales) was used to measure the variables of physical activity (8 items), nutritional intake (9 items), stress management (8 items), interpersonal relationships (9 items), spiritual growth (9 items), and health responsibility (9 items; Walker et al., 1995). Response choices for all items on the HPLP

II subscales ranged from 1 to 4: 1 = never, 2 = sometimes, 3 = often, and 4 = routinely. Higher scores indicate a greater number, or frequency, of healthy behaviors.

Total HPLP II scale at T2. The total scale score for the HPLP II reflected the mean scores for the six subscales. The mean was the same as the total scale at T1, and the frequency of healthy behaviors for the six subscales, overall, was similar.

Physical activity at T2. Fifty-seven participants (80.3%) were not regularly physically active at T2, with six participants (8.4%) being less physically active than at the beginning of the semester. This was reflected in the reduction in the mean subscale score from 2.51 at T1, to 2.47 at T2.

Nutrition at T2. The mean for the Nutrition subscale also decreased from T1 to T2, indicating participants made less healthy food choices over the semester. Sixty-three participants (88.7%) responded that they "never to sometimes" made healthy food choices, with only eight participants (11.3%) indicating "often to routinely" eating a healthy diet.

Stress management at T2. When reporting stress management practices, the mean score for the subscale improved, overall, from 2.55 to 2.61, with 65 participants (90.3%) indicating that they followed stress management practices "sometimes-to-often". However, an additional five participants (6.6%) indicated a lower frequency of stress management measures, when compared with the T1 responses.

Interpersonal relations at T2. The subscale of healthy interpersonal relations had one of the highest means for the HPLP II, at 3.1- "often". The means for the subscale were similar between T1 and T2, with a slight increase from T1 to T2.

Spiritual growth at T2. The subscale of spiritual growth had the highest mean

for the HPLP II, at 3.2. The response frequencies at T1 to T2 were similar, with a slight

increase in the mean at T2.

Health responsibility at T2. The subscale of health responsibility had the lowest

mean, 2.0, for the subscales of the HPLP II at T2. The Health Responsibility subscale

also had the lowest mean at T1, at 1.9.

Sedentary Behavior Scale at T2

Sedentary behavior was measured using the six-item SBS, developed by Utter et

al. (2003). Participants were queried on how many hours were spent television/video

watching, reading and doing homework, and using the computer in activities unrelated to

schoolwork. Possible responses for each item included: 1 = none, 2 = ½ hour, 3 =1 hour,

4 = 2 hours, 5 = 3 hours, 6 = 4 hours, 7 = 5+ hours. The grand total for the six items on

the SBS was divided by six, with a mean score range of 1 to 7. A higher score

represented a higher level of sedentary behavior. The mean for the scale was 4.5, or an

average of 2-3 hours per day was spent on sedentary behaviors. There was a slight

increase in the mean for sedentary behavior over the semester.

<div align="center">

Normality at T2

</div>

Normality was assessed for the study variables at T2 with assessment of normality

plots, the Kolmogorow-Smirnov test (*K.S.*); skewness (skew) with the standard error (*SE*)

and z-score; and kurtosis (kurt) with the standard error (*SE*) and z-score. Upon

assessment of the normality of the continuous variables at T2, two variables were

determined to approach normal distribution: HPLP II- Physical Activity and the SBS.

Therefore, non-parametric statistics were performed on the T2 variables, in order to perform the exploratory analyses.

<div align="center">**Exploratory Analyses- Results**</div>

Two exploratory analyses were conducted; the first to determine if there was a statistical change in BMI from T1 to T2. In addition, the same IVs used in the regression for weight change (except change in height) were analyzed to determine if they predicted BMI change. The second analysis was performed to determine if there were significant differences between the T1 and T2 measures of the instrument scales and subscales used within the study.

BMI Change

First, a Wilcoxon signed-rank test was used to determine if there was a significant BMI change from T1 to T2. Based on the Wilcoxon signed-rank test, a statistical difference was found in the BMI between T1 and T2, with a mean increase in BMI of 0.43 kg/m^2 ($p \leq .01$). The median of the BMI from T1 to T2 increased from 23.25 to 23.85 (0.65 kg/m^2). A t-test was also performed to determine the effect size of this variable, and also demonstrated a significant difference in BMI from T1 to T2, ($M= 24.6$, $SD=6.58$) to T2 ($M= 24.9$, $SD= 6.07$, $t(75)= -2.29$, $p= .02$). The eta-squared statistic (.06) indicated a moderate effect size.

BMI change and BMI categories. First, a Mann-Whitney test was performed for the dichotomous BMI categories variable (underweight/normal; overweight/obese). There was a significant difference in BMI change and the dichotomous variable of BMI categories on the Mann-Whitney test, between underweight/normal *(Mdn = .45)* and overweight/obese *(Mdn = -.20)*, $U = 431.5$, $z = 2.15$, $p = .03$. The t-test, performed to

determine effect size, was also significant for change in BMI and (dichotomized) BMI categories at T1, for underweight/ normal (*M*= 0.6, *SD*= 1.2) and overweight/obese (*M*= -0.1, *SD*= 1.6 , *t*(74)= 2.20, *p*= .03). The eta-squared statistic (.06) indicated a moderate effect size

   BMI change and gender, ethnicity and race. Mann-Whitney tests were also used to determine if there were differences in BMI change related to gender, ethnicity, or race. Each categorical variable was dummy-coded prior to analysis. The Mann-Whitney test for gender showed no statistically significant difference in BMI change between females *(Mdn* = .40) and males (*Mdn* = .30), *U* = 626.5, *z* = -.75, *p* = .45. In addition, there was not a significant difference based on ethnicity, between non-Hispanic (*Mdn* = .15) and Hispanic participants (*Mdn* = .45), *U* = 777.5, *z* = 1.14, *p* = .26. There was also no significant difference in BMI change between White (*Mdn* = .35) and Non-White participants (*Mdn* = .35), *U* = 684.5, *z* = -.06, *p* = .95.

   BMI change and HeLP variables. The relationships between BMI change and the HeLP variables (physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility) were determined, using Pearson's bivariate correlations (see Table 12). Pearson's bivariate correlations were performed to determine if there were significant linear relationships between BMI change and the HeLP scales and subscales.

   Two variables, the BSQ at T1 (*r*= .27, *p*= .03) and the HPLP II Health Responsibility subscale at T1 (*r* = -.27, *p*= .02) revealed small, significant relationships with BMI change; the shared variance for the BSQ and BMI change was 7%. With the

BSQ, as the number of unhealthy snacks and beverages increased, the BMI change also

increased.

Table 12. *Pearson's Correlations of Continuous Variables and BMI Change*

Independent Variable		BMI Change
HPLP Total at T1	Pearson Correlation	-.18
	Sig. (2-tailed)	.12
	N	70
BSQ at t1	Pearson Correlation	.27
	Sig. (2-tailed)*	.03
	N	68
SAQ subscale	Pearson Correlation	-.17
	Sig. (2-tailed)	.15
	N	74
HPLP Physical Activity subscale at T1	Pearson Correlation	-.08
	Sig. (2-tailed)	.50
	N	71
HPLP Nutrition subscale at t1	Pearson Correlation	-.16
	Sig. (2-tailed)	.18
	N	70
HPLP Stress Management subscale at T1	Pearson Correlation	.08
	Sig. (2-tailed)	.52
	N	72
HPLP Interpersonal Relations Subscale at T1	Pearson Correlation	-.13
	Sig. (2-tailed)	.26
	N	73
HPLP Spiritual Growth Subscale at T1	Pearson Correlation	-.22
	Sig. (2-tailed)	.07
	N	70
HPLP Health Responsibility Subscale at T1	Pearson Correlation	-.27
	Sig. (2-tailed)*	.02
	N	72
SBS at T1	Pearson Correlation	.01
	Sig. (2-tailed)	.99
	N	73

Correlation is significant at the 0.05 level (2-tailed).

The shared variance for the Health Responsibility subscale and BMI change was also 7%. However, this was an inverse relationship, as the level of health responsibility decreased, the BMI increased. Since these two bivariate relationships were significant, they were entered into the regression equation, along with the BMI categories dichotomous variable.

Regression Model- BMI Change

To answer which independent variables predicted BMI change, a standard multiple regression was conducted with the dependent variable, BMI change, and the three IVs that demonstrated significant relationships to the DV: the Health Responsibility subscale at T1, the BSQ at T1, and the dummy coded BMI categories at T1, with Group 1- underweight/normal being coded as "0" (n= 52), and Group 2-overweight and Group 3- obese collapsed into one category and coded as "1" (n= 24). The IVs were entered into the regression equation in a single block. A summary of the regression coefficients is presented in Table 13.

Table 13. *Final Regression Model- BMI Change*

	B	SE(B)	Beta	t	p
Constant	-1.16	2.04		-.57	.57
BMI Categories- T1	-.86	.36	-.29	-2.40	.02
Total BSQ at T1	.61	.41	.19	1.48	.14
HPLP II Health Responsibility- T1	-.33	.34	-.13	-.98	.33

The assumptions of linear relationships, collinearity diagnostics, and homoscedasticity were evaluated for the dependent variable, BMI change, and the three IVs: BMI categories, the BSQ, and the HPLP II Health Responsibility subscale. The

assumptions of linearity, independence of errors, homoscedasticity, and normality of residuals were met.

The regression results indicated an overall model of only one predictor; (dichotomized) BMI categories at Time 1 significantly predicted BMI change, $R^2 = .18$, Adj. $R^2 = .14$, $F(3,61,) = 4.58$, $p = .01$. This model accounted for 14.0% of variance in BMI change. After controlling for total BSQ and Health Responsibility scores, baseline BMI category accounted for slightly less than 1 unit of BMI change (-.86), which is very likely not clinically meaningful. As the coefficient was negative, that implied that relative to a participant with normal or underweight BMI at baseline, students who were overweight or obese at baseline had an average decrease of .86 in BMI by Time 2, after adjusting (controlling) for health responsibility and BSQ scores.

Change in Scales/Subscales Between T1 and T2

In a second exploratory analysis, differences in the measures of beverage and snack intake, physical activity, sedentary behavior, nutritional intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility, from T1 to T2, were evaluated using paired (dependent) Wilcoxon signed-ranks testing. A two-tailed significance value of $\leq .005$ was used to maintain a family-wise significance level of $p \leq .05$ for these 10 comparisons (see Table 14). Using this criteria, there was one variable that demonstrated a significance level $\leq .005$; the SAQ-drinking patterns subscale. The difference between the medians indicated that there was an increase in the frequency and amount of alcohol consumption of participants over the first semester of college. The remaining scales/subscales did not demonstrate a significant change.

Table 14. *Comparison of Scales/Subscales at T1 and T2, Using Paired Wilcoxon Signed-Rank Tests*

Variables	Means (T1 / T2)	Medians (T1 / T2)	Wilcoxon Signed-Rank Alpha
Beverage and Snack Questionnaire[a]	4.0 / 4.1	4.0 / 4.0	.27
SAQ-Drinking Patterns Subscale [b]	4.6 / 4.4	4.9 / 4.5	≤..001*
HPLP II Total Scale [c]	2.5 / 2.5	2.5 / 2.5	.90
Physical Activity Subscale	2.5 / 2.5	2.3 / 2.4	.43
Nutrition Subscale	2.4 / 2.3	2.3 / 2.3	.16
Stress Management Subscale	2.6 /2.6	2.5 / 2.6	.32
Interpersonal Relations Subscale	3.0 / 3.1	3.1 / 3.1	.06
Spiritual Growth Subscale	3.2 / 3.2	3.2 / 3.3	.93
Health Responsibility Subscale	1.9 / 2.0	1.9 / 2.0	.01
Sedentary Behavioral Scale [d]	4.3 / 4.5	4.2 / 4.5	.04

[a]Neuhouser et al., 2009. [b]Engs, 2007. [c]Walker et al., 1995. [d]Utter et al., 2003
*Two-tailed significance value of ≤ .005 needed to maintain a family-wise significance level of $p ≤ .05$ for 10 comparisons.

On the paired Wilcoxon signed-rank tests, there was one variable that demonstrated a significance level ≤ .005; the SAQ-drinking patterns subscale. The difference between the medians indicated that there was an increase in the frequency and amount of alcohol consumption of participants over the first semester of college. The remaining scales/subscales did not demonstrate a significant change.

In Chapter V, further interpretation of the findings and the applicability to Pender's Health Promotion Model will be assessed. Strengths, limitations, implications for nursing practice, and recommendations for future research are also discussed.

Chapter 5

DISCUSSION

Chapter 5 includes a summary of the research findings, a comparison of the findings to previous literature review, and a presentation of the major topic areas that provided significant findings in this study. The findings, with application of the theoretical framework, the Health Promotion Model (Pender, et al., 2006), will then be discussed, as well as future implications for nursing practice. The strengths and limitations of the study, and indications for future research, are also presented.

Summary of Findings

A summary of the findings for each research question, and the hypothesis, is presented. Participants were recruited from a southwestern public university in the fall semester of 2011, and were first time freshmen, and 18-19 years of age at T1. Data collected included: height, weight, and the on-line HeLP survey at both T1 (weeks 2-3 of the semester) and T2 (weeks 14-16 of the semester). At T2, there were 76 participants with complete sets of data for analysis.

Research question one was: Was there significant weight change in the first semester of college?.The change in weight ranged from an increase in weight of 22.2 pounds, to a decrease in weight of 26.0 pounds, over the first semester of college (15-week duration). A statistically significant difference was found between T1 (*Mdn.* = 148.40, *M*=156.9) and T2 (*Mdn.* = 152.5, *M*= 159.2), with a mean increase in weight of 2.3 pounds over the first semester of college. Determination of weight gain of clinical significance ($\geq$ 3.5 pounds) was also investigated; 42.3% (33/76) of participants gained 3.5 pounds or more.

Research question two was: What were the effects of gender, ethnicity, and race on weight change in first-semester college freshmen after controlling for their baseline (T1) BMI category and any change in height from T1 to T2? First, there was a significant difference for weight change and BMI categories; participants in the lowest BMI category, 1 (underweight/ normal), gained more weight than those in category 2 (overweight) and 3 (obese) categories. Overall, there were no associations found between weight change and height change, gender, race, or ethnicity.

Research question three was: Did self-reported physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility predict first-semester freshman weight change, after accounting for baseline BMI, height change, gender, ethnicity, and race? In addition, the hypothesis was that weight change over the first semester of college would be associated with higher levels of sedentary behavior, beverage and snack intake, alcohol consumption, and lower levels of physical activity, good nutritional intake, stress management, interpersonal relations, spiritual growth, and health responsibility.

Only two variables were significantly associated with weight change in bivariate analyses. Health responsibility was inversely correlated; the stronger the perceptions of health responsibility, the less weight gain participants experienced. Additionally, as noted above, participants in the underweight/normal BMI category gained more weight than those in the overweight or obese categories. When these two variables were entered into the final regression equation to predict weight change, the model was significant and accounted for 12% of variance in weight change.

In addition to the three research questions and the hypothesis, exploratory analyses were conducted to see if there was a significant difference in the BMI from T1 to T2, and to determine if the IVs (except for change in height) predicted the change in the BMI. Finally, significant bivariate differences between the measures from T1 to T2 were evaluated for the variables of physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, spiritual growth, and health responsibility.

The first exploratory analyses demonstrated that BMI category (underweight/normal) was the only predictor for BMI change and accounted for 14% of the variance. Additionally, in the second exploratory analysis, the only variable change between T1 and T2 that was significant was alcohol consumption; there was a significant increase in both the median frequency and the amount of alcohol consumed during the first semester of college.

In summary, in the first semester of college, an underweight/normal BMI and a lower level of health responsibility predicted 12% of weight gain experienced by participants. In the exploratory analyses, the underweight/normal BMI category predicted 14% of BMI change. In addition, an increase in alcohol consumption, in both the amount of intake and frequency, was noted over the first semester of college. However, this variable was not a significant factor in weight change.

Comparison to Published Literature and Discussion of Research Findings

This section provides a discussion of the major findings from the study. The findings confirmed prior research as well as provided new information. The themes under discussion include clinically significant weight change in first semester freshmen; initial

BMI category (underweight/normal weight, overweight, obese), and the level of Health

Responsibility as predictors of weight change. The variables that demonstrated a

relationship to weight gain in college students and older adolescents/young adults in

previous research are also reviewed. Finally, the integration of findings with the Health

Promotion Model is discussed.

Clinically Significant Weight Gain

The phenomenon of significant weight gain in college freshman was found in this

study, similar to the results of previous research. Brown's (2008) meta-analysis of 14

studies of U.S. freshman weight gain ($N = 1,858$) revealed that students gained an

average of 4.6 pounds over the first year of college, with mean weight gain, per study,

ranging from 2.4 to 8.8 pounds. Other studies have shown similar results, with 3.3 to 7.8

pounds gained in the first year of college (Cluskey & Grobe, 2009; Gropper et al., 2009;

Lloyd-Richardson et al., 2009; Racette et al., 2005; Wengreen & Moncur, 2009).

Levitsky et al. (2004) reported a 4.2-pound mean weight increase in the first 12 weeks of

the freshman semester.

To determine a value for clinically significant weight gain, results from two prior

studies were employed (Levitsky et al., 2004; Stevens et al., 2008). Based on these

calculations, a positive mean weight change of ≥ 3.5 pounds between T1 and T2

indicated clinically significant weight gain for this study cohort. In this study, 33

participants (42%) gained ≥ 3.5 pounds, with participants gaining an average of 2.3

pounds in the first semester of college.

Initial BMI Category as a Predictor of Significant Weight Change

In this study, only those in the underweight/normal BMI category predicted weight gain in the regression model. Previous studies have indicated that students at highest risk for clinically significant weight gain were those who were overweight or obese upon admission to college (Brown, 2008; Gordon-Larsen et al., 2010; Ogden et al., 2008). Several previous studies noted a mean increase in BMI , ranging from $\pm$ 0.3- 1.0 kg/m^2 for students in the first year of college, but weight gain differences, based on BMI categories, were not examined in these studies (Gropper et al., 2009; Hoffman et al., 2006; Racette et al., 2008).

Cluskey and Grobe (2009) found that 25% of participants gained $\geq$ 5.0 pounds in the first semester of college, with males in the overweight and obese BMI groups at risk. Additionally, similar to this study, the researchers also found that both genders in the underweight/ normal BMI category also gained clinically significant weight (38% of males, 33% of females in the underweight/normal BMI category).

Lloyd-Richardson et al. (2009) followed students through the first year of college and found that the majority of students remained in the normal BMI category, with those in the overweight/obese category increasing from 15% to 18%. The current study demonstrated a much higher percentage of overweight (20%) and obese (12%) participants at T1 (32% total overweight/obese) when compared to the Lloyd-Richardson et al. (2009) study, and the percentage of change among the BMI categories was different, with three participants (4%) in the underweight/normal BMI group moving into the overweight category.

In summary, a closer examination of the increase in BMI categories from T1 to T2 identified those participants at most risk for clinically significant weight gain in this study. Fifty percent of the underweight/normal weight group experienced clinically significant weight gain, compared to 33% of the overweight group and 22% of the obese group. For the 42% of participants who gained clinically significant weight (≥ 3.5 pounds), 79% were in the underweight/normal BMI category, 15% were in the overweight category, and 6% were in the obese category.

Gender, Race and Ethnicity

In this study, there were no differences found in weight change that was related to gender, race or ethnicity. In several previous studies, a relationship was noted in weight gain between male and female college students, with males having a greater increase in weight gain (Cluskey & Grobe, 2009; Gropper et al., 2009; Lloyd-Richardson et al., 2009; Nelson et al., 2007; Racette et al., 2005). However, this relationship appears equivocal; three studies with college students found no differences related to gender (DeBate et al., 2001; Economos et al., 2008; Hoffman et al., 2006), similar to the findings of this study.

Only one prior study, by Nelson et al. (2007), indicated that college weight gain varied across racial/ethnic groups, with both genders of Black/African Americans and Hispanic males experiencing significant weight gain. However, similar to this study, three other studies with college freshmen found no difference in weight gain based on race or ethnicity (DeBate et al., 2001; Gropper et al., 2009; Hoffman et al., 2006).

Physical Activity and Sedentary Behavior

The level of physical activity, and conversely, the number of hours of sedentary behavior did not have a significant relationship with weight gain in this study. In a meta-analysis of physical activity in college students, 40% to 50% reported being physically inactive (Keating et al., 2005), and McArthur and Raedeke (2009) found that only half of college students were physically active for a minimum of 30 minutes of MVPA (moderate-to-vigourous physical activity) most days of the week. In a related study, Wengreen and Moncur (2009) reported that for those who gained 5% or more of their original body weight in the first semester of college (23%), the sole significant finding was that they participated in less physical activity in the first semester of college, when compared with high school.

In a study examining sedentary behavior, Fountaine et al. (2011) found that in college students, an average of 10.5 hours per week of screen time were spent on computers or gaming, with seven hours per week spent on television viewing. Boone et al. (2007) found that in adolescent females, television watching was negatively correlated with exercise and physical activity time, whereas time on the computer was negatively correlated with time spent on exercise/physical activity in males. Racette et al. (2008) also found that 29% of freshmen were largely sedentary, and Buckworth and Nigg (2004) reported similar findings in college students, with an inverse correlation between sedentary behavior and physical activity for both genders. Fountaine et al. (2011) was the sole study that did not demonstrate a finding that physical activity and sedentary behavior were inversely correlated.

These previous studies followed students over the first year of college or longer. Participants within the present study were advised to enroll in a wellness course in the first semester of college, which included a physical activity component. Following these participants over a longer period of time, in which a formalized physical activity course was not mandated, may have resulted in similar findings that an increase in sedentary behavior, or decrease in physical activity, were associated with significant weight gain.

Nutritional Intake

Nutritional intake (Walker et al., 1995) and the Beverage and Snack Questionnaire (BSQ) (Neuhouser et al., 2009) did not have a significant association with weight gain in the current study. Factors within the university environment that may result in increased caloric intake and increase the risk of weight gain include large portion sizes, unlimited food intake at each meal (cafeteria food plan), fast foods, frequent snacking, and inexpensive food sources containing higher amounts of simple carbohydrates, fats, and sodium (Brehm & D'Allesio, 2010). Levitsky et al. (2004) found that consumption of "junk food"; meal frequency on weekends; eating in the cafeteria, snack bar or a restaurant; recent dieting and evening snacks (6%) were major factors predicting weight gain. In the study, college freshmen gained an average 4.2 pounds in the first 12 weeks of the fall semester. In another study, Driskell et al. (2005) reported that 95% of freshmen and sophomores reported eating at fast-food restaurants 6 to 8 times/week, with only 26.2% typically eating meals in the school cafeteria.

In the present study, the mean weight gain was less than in the Levitsky et al. (2004) study for the first semester of college (2.7 vs. 4.2 pounds). Additionally, the frequency of eating snack and junk foods were not significant factors relating to weight

gain in the present study, as measured by the Nutrition subscale of the HPLP II (Walker et al., 1995) and the BSQ (Neuhouser et al., 2009). It was also noted that these two instruments had low internal reliability consistency in the present study; the Nutrition subscale had the lowest Cronbach's alpha of all the subscales of the HPLP II (.67 at T1 and .68 at T2), and the BSQ reliability coefficients were also low (.60 at T1 and .50 at T2). Using instruments that more reliably measured changes in nutritional patterns might have captured a significant relationship between weight gain and food choices in this group of students.

Alcohol Intake

In an exploratory analysis within this study, there was a finding of a significant increase in alcohol consumption, in both the frequency of intake and number of drinks, but the amount and frequency of alcohol consumed was not related to weight gain. However, an increase in alcohol consumption, specifically binge drinking (4-5 drinks in one episode) has been associated with obesity in prior studies. Breslow and Smothers (2005) found that adults who reported drinking four or more drinks per episode had significantly higher BMIs than those who consumed fewer drinks per episode. Binge drinking in university students has also been associated with unhealthy diet choices (infrequent breakfast consumption; reduced fruit/vegetable intake; increased fast-food intake and frequency); increased sedentary behavior; and increased risk of weight gain (Nelson, Lust et al., 2009). Nelson, Lust et al. (2009) also found that the prevalence of binge drinking for freshmen was at 28.8% and increased each undergraduate year.

In studies relating to alcohol consumption in college students, Sutfin et al. (2009) found that 68% of entering college freshmen reported consuming alcohol in the previous

three months, and Economos et al. (2008) found the number of students who reported

drinking alcohol more than doubled over the first year of college from 29% to 60%.

However, while an increase in alcohol intake for college students was found in these

prior studies, only Nelson, Lust et al. (2009) found a direct relationship between weight

gain and alcohol consumption in college students, and the finding was significant only for

those participants who were overweight or obese and for those who were binge drinking.

In this study, the majority of students who gained weight were underweight/normal by

BMI category (79%). In addition, while there was an overall increase in alcohol

consumption over the first semester of college, the mean on the SAQ (Engs, 2007)

declined from 4.6 to 4.4 (out of 5.0 possible), which still indicated rare alcohol intake,

and a low number of drinks consumed at each drinking episode, for the majority of

participants. Continuing the study over the first full year of college may have resulted in a

higher incidence of alcohol consumption and binge drinking, which has been

demonstrated as a risk for weight gain in prior studies.

Stress Management

Increased stress and poor coping skills have been reported as risk factors for

weight gain in college students (Martyn-Nemeth et al., 2009; Ritter, 2006). In three

qualitative studies with college students (Cluskey & Grobe, 2009; Greaney et al., 2009;

Nelson, Kocos et al., 2009), stress was cited by students as a major reason for overeating

and weight gain. Additionally, in a study of weight gain and related stressors over the

first year of college (Economos et al., 2008), 80% of students experienced weight gain,

with 70% indicating weight gain was related to stressful events. College freshmen

reported significant stress related to academic expectations, academic performance, and

roommate conflicts. However, weight gain and the level of stress were not significantly correlated in the study. The study by Nelson et al. (2008) found similar results, with no significant correlations between stress and weight gain.

These prior findings concur with the results of this study. Using the Stress Management subscale of the HPLP II (Walker et al., 1995), no relationship was found between weight gain and level of stress. Therefore, although students perceive that there is a relationship between stress and weight gain, three different studies have not been able to support the perception. This may be attributable to several factors: the perception is not accurate; there are measurement problems related to the concept of stress (e.g., Cronbach's alpha of 0.65 at T1 in this study); or because of issues with construct validity (a measurement of actual stress used versus a measurement of stress management, as was done in this study).

Interpersonal Relations

Nelson, Kocos et al. (2009) reported that although some freshman students experienced positive social support at college, other freshmen stated they did not find social support for health-related behaviors. In a related study, Greaney et al. (2009) noted that there was negative social peer pressure to overeat, to eat fast food on a frequent basis, and to drink excessive amounts of alcohol in college; which are all factors that can contribute to weight gain. In focus groups conducted by Cluskey and Grobe (2009), college students stated that the lack of family social support, lack of healthy family routines, and feelings of instability in the first year of college were major reasons for weight gain. In a related study by Economos et al. (2008), 70% of freshmen identified

interpersonal conflicts within relationships as the primary reason associated with weight gain over the first year of college.

However, after adjusting for other variables, interpersonal relations were not a predictor for weight change in these studies, and Economos et al. (2008) noted that the variable of interpersonal relations was not a predictor for weight gain in the first semester of college; results which were similar to the findings of the present study. Using the Interpersonal Relations subscale of the HPLP II (Walker et al., 1995) in the present study, no association was found between weight gain and interpersonal relationships. Therefore, although college students report a relationship between interpersonal relationship difficulties and weight gain, two different studies did not support this view. This may be attributable to several factors, including that the perceptions of college students about this issue are not accurate, or the Interpersonal Relations subscale used may not accurately measure this construct (Cronbach's alpha of 0.83 at T1 in this study).

Spiritual Growth

The developmental stage of late adolescence/emerging adulthood is a time for an exploration of self-identity and spirituality (Pope, 2005). In a study performed at UCLA (2007), findings revealed a strong relationship between high levels of spirituality and positive health practices, including consuming healthier diets and reporting better physical health. Callaghan (2005) also found a strong relationship between spiritual growth and self-care responsibility and initiative. However, no study was identified that measured the direct relationship between weight change and spirituality in adolescents or college students. In the present study, the Spiritual Growth subscale of the HPLP II (Walker et al., 1995) did not demonstrate a significant relationship with weight gain.

Health Responsibility

Health responsibility involves an active sense of accountability for one's own health through education and health-promotive actions (Callaghan, 2003, 2005, 2006; Walker & Hill-Polerecky, 1996). The nine items on the Health Responsibility subscale included four items related to seeking health education/guidance to increase health knowledge, four items related to seeking healthcare for perceived health problems/questions, and one item related to monthly self-examination for physical changes (Walker et al., 1995).

The subscale, Health Responsibility, was the sole subscale of the HPLP II (Walker, et al., 1995) that demonstrated a significant relationship with weight change. An inverse relationship was demonstrated - the lower the score on the Health Responsibility subscale, the higher the weight gain. In addition, the Health Responsibility subscale had the lowest mean of the six HPLP II subscales (1.90 at T1 and 2.04 at T2), demonstrating that participants, overall, exhibited a low level of responsibility for healthy behaviors. (In comparison, the other HPLP II subscale means ranged from 2.37 - 3.18 at T1 and 2.32 - 3.18 at T2.)

No previous study using the HPLP II (Walker et al., 1995) with U.S. college students was found. However, in a study of U.S. adolescents, ages 14-19, Callaghan (2005) also reported that the Health Responsibility subscale mean was 2.0, the lowest subscale mean on the HPLP II for that study. Additionally, in a cross-sectional study among college students in Hong Kong using the Chinese version of the HPLP II (Lee & Yuen Loke, 2005), student responses demonstrated low levels of Health Responsibility, with a mean of 1.9; again, the Health Responsibility subscale had the lowest average

response on the six subscales of the HPLP II. In another study using the Japanese version of the HPLP II during the first year of college, Health Responsibility was found to have the lowest mean of the HPLP II subscales, at 2.0 during the first year of college (Wei et al., 2011).

In two studies with U.S. adults, however, the Health Responsibility subscale means were higher than those seen in college students (Johnson, 2005; Kemppainen et al., 2011). In a study of U.S. adults (*n*= 105) with hypertension, ages 30-89, the mean subscale score for health responsibility was 2.3, and there was not a significant difference in the Healthy Responsibility subscale scores between those younger than 50 years and those older than 50 (Kemppainen et al., 2011). In Johnson's (2005) study with a convenience sample of 223 African-American participants, ages 18-90 (*M* = 37.2 years), the Health Responsibility subscale mean was also higher than in this study, at 2.6.

Health responsibility had not been directly linked to weight gain in prior studies, but related constructs have been linked to other health-promoting behaviors. Jackson et al. (2007) determined that the variables of health self-efficacy and health value predicted 51% of the level of engagement in health promotion behaviors, including activities related to nutrition, psychological well-being, physical activity, and general preventive health practices. Callaghan (2003, 2005, 2006) reported similar findings of self-care responsibility and initiative to perform healthy lifestyle behaviors in adolescents, including physical activity and nutrition.

In summary, in three studies from geographically disparate college student populations, the Health Responsibility subscale mean was consistently low, compared to the other HPLP II subscales (Walker et al., 1995). Similar findings were reported in three

studies with adolescent populations as well. Although in these prior studies, the relationship between weight change and health responsibility was not examined; in this study, a lower level of health responsibility was inversely related to weight gain.

Application of the Theoretical Framework- Pender's Health Promotion Model

Pender's HPM (Pender et al., 2006) was used as the theoretical model for the conceptualization of the personal, interpersonal, and situational influences that relate to the actions and behaviors that are health promotive for college freshmen, in particular, those factors related to weight change. The determinants of the HPM can have either a negative or positive influence on health-promoting behaviors, through on-going interaction within the environment.

In this study, there was not broad support for the HPM (Pender et al., 2006), as it applies to maintaining, or obtaining a healthy weight level. The interpersonal and situational characteristics of physical activity, healthy nutritional intake, low/no alcohol consumption, stress management, interpersonal relations, and spiritual growth were not associated with freshman weight change. Personal factors that were not associated with weight change in this study included gender, race, and ethnicity. However, the variable of health responsibility, with personal, interpersonal and situational components, did demonstrate an inverse relationship with obtaining/maintaining a healthy weight, with 42% of the participants gaining clinically significant weight ($\geq$ 3.5 pounds).

Health Responsibility and the HPM

There was one variable from the HPLP II (Walker et al., 1995) - a low level of Health Responsibility - that indicated that freshmen might not yet perform consistent behaviors related to the maintenance of a healthy weight. While health responsibility

involves goal-directed knowledge and behaviors to perform health-related actions (Callaghan, 2003), a closely related concept in the HPM (Pender et al., 2006), *perceived self-efficacy*, is defined as one's perception of the personal ability to carry out specific health behaviors.

A sense of health responsibility, and perceived self-efficacy, may not be well established in college freshmen during the developmental stage of emerging adulthood. According to Tanner and Arnett (2009), in this stage older adolescents are just beginning to explore commitment to adult roles, responsibilities, and health-related activities, and healthy lifestyle routines have not yet become routine. During this time, two major factors influence health status: the transition from adolescence to adulthood and weakening of the safety net supported by parents and other adults that was present during childhood (Park et al., 2006), and this may explain the low scores for health responsibility in freshman students.

In a prior study, a meta-analysis of predictors of positive health practices in adolescents and adults (Yarcheski, Mahon, Yarcheski, & Cannella, 2004) demonstrated that perceived self-efficacy had a strong relationship to positive health practices. Callaghan (2006) also found significant relationships between healthy lifestyle behaviors and perceived self-efficacy levels in adolescents.

Additionally, the developmental stage of emerging adulthood and related low level of perceived self-efficacy, or health responsibility, may have also played a role in clinically significant weight gain in this study for 42% of the participants, a result of inconsistent health-related behaviors. At particular risk were those participants in the underweight/normal BMI category, who may not have appreciated the health risk related

to rapid weight gain, because they possessed little experience in being responsible for actions related to health-related activities (Tanner & Arnett, 2009).

With a lower level of health responsibility, a sense of accountability for one's own health actions would be reduced (Walker & Hill-Polerecky, 1996). According to the HPM (Pender et al., 2006), with a corresponding reduction in the level of perceived self-efficacy, perceived barriers to action would increase, and simultaneously, there would be a decrease in the level of commitment to, and inconsistent performance of, health-promoting behaviors necessary to maintaining a healthy weight (see Figure 1).

In this study, freshmen exhibited a lower level of health responsibility than the other interpersonal factors under study, and a lower level of health responsibility was found to be an inverse predictor of weight gain. Additionally, it was determined that underweight/normal weight participants experienced a higher incidence of weight gain than those who were in the overweight and obese BMI categories.

This led to an exploration of the unique developmental phase of emerging adulthood and consideration that unfamiliarity and inexperience of taking personal responsibility for health issues may potentially affect the performance of consistent health promotion behaviors, based on the HPM model (Pender et al., 2006; Tanner & Arnett, 2009). In addition, the personal, interpersonal, and situational influences, as defined by the HPM, which resulted in clinically significant weight gain for college freshmen, were explored. Through careful data analysis, a new risk group for rapid weight gain was identified- freshmen who were in the underweight/normal BMI category.

Limitations of the Study

In this section, the limitations of the study are examined. Strengths of the study, which may somewhat counter the limitations, are also discussed.

Convenience Sample

First, the results of the study may not be generalizable. A convenience sample was recruited for this exploratory descriptive study, and the participants were from a single, small southwestern university. Therefore, the findings may differ from those found in populations of students from other universities, or might vary, if conducted in a different sociocultural environment. Likewise, the study results do not address weight gain in college freshmen who do not live in campus housing, are older than 19 years old, or are not enrolled in college.

Attrition

There was an unforeseen flaw in the data collection procedure, possibly resulting in threats to internal and statistical conclusion validity. While 166 participants were originally recruited for the study, only height and weights were measured on the day of recruitment; the HeLP survey was not made available to participants, on-line, until 2-3 days after recruitment. Therefore, not having the participants complete the HeLP survey immediately was a missed opportunity, and resulted in a major consequence, with only 90/166 (54.2%) completing the HeLP survey at T1.

At T2, in an effort to capture the questionnaire measurements from as many participants as possible, five laptops were available within the same location as the height/weight measurement stations, and a higher percentage of participants completed

the HeLP survey concurrently. Using this procedure, 76/90 participants (84.4%)

completed the height/weight measures and the HeLP survey at T2.

Selection Bias –Differential Attrition

In spite of the 16% attrition rate and the smaller sample size than anticipated, the

demographics of the sample closely reflected the gender and race/ethnicity

(Hispanic/non-Hispanic) of the entering freshman class (ENMU, 2012). There was a

decrease, however, in those who did not complete the study in the obese BMI group, with

four participants (2.6%) dropping out of the study from T1 to T2. There may have been a

greater tendency of obese participants who gained weight to drop out of the study.

However, it cannot be substantiated that those who did not complete the study differed

substantially from those who did, relative to the key outcome of interest, weight change.

Sample Size

As noted above, the sample size for this study was smaller than planned (*N*=76),

resulting in potential problems with statistical conclusion validity. Prior to the study

implementation, a minimum of 135 to 170 participants was considered to be a sufficient

sample to obtain significant findings with 14 predictors, while maintaining 80% power to

detect a medium effect size for the regression model as a whole. With a sample size

smaller than anticipated, another power analysis was performed to determine the number

of predictors that could be entered into the regression equation, while maintaining 80%

power to detect a medium effect size. Based on this calculation, it was determined that a

maximum of three predictors could be entered into the regression equation.

Bivariate analyses were conducted to make decisions about which of the 14

predictors to enter into the final regression analysis. In these preliminary analyses, only

two variables demonstrated a relationship with weight gain (BMI category and health responsibility), so the limited power of the smaller sample size may not have affected the statistical conclusion validity of the final analysis.

Poor Reliability of Some Measures

Another possible limitation of the study was that three of the instruments did not meet the desired internal reliability of a Cronbach's alpha coefficient of .80 for established instruments. The BSQ (Neuhouser et al., 2009) had Cronbach's alpha coefficients of .50 at T1 and .60 at T2, and the SBS (Utter et al., 2003) had Cronbach's alpha coefficients of .66 at T1 and .64 at T2. The SAQ-Drinking Patterns Subscale (Engs, 2007) had a Cronbach's alpha coefficient of .78 at both T1 and T2. On the HPLP II (Walker et al., 1995), several of the subscales did not meet the desired internal reliability. The Nutrition subscale had Cronbach's alpha coefficients of .67 at T1 and .68 at T2, and the Stress Management subscale reliability coefficients were.65 at T1 and .72 at T2. The Physical Activity subscale reliability coefficient was .77 at T1 and .82 at T2.

T1 measures were used in the main analysis, and unreliable instruments may have led to difficulty with the detection of relationships between the variables. Using instruments with a higher level of reliability may have allowed for detection of an association with weight change with these variables.

Construct Validity

Finally, there may have been limitations associated with construct validity. Since there was only one subscale, or construct, that demonstrated a significant relationship with weight change (Health Responsibility), there might have been inadequate explication of the constructs represented in the instruments employed in the study.

Additionally, construct mislabeling, or failure to include multiple dimensions of the construct within each instrument could also have resulted in measurement error. Therefore, a lack of significant associations was found between some of the independent variables and weight change.

Implications for Future Research

This study has several implications for future research. First, identification of participants in the underweight/normal weight category as the group at most risk for clinically significant weight gain in this study was a finding that merits further exploration. A targeted interventional study for this newly identified risk group could result in a reduction of clinically significant weight gain. Previous studies have demonstrated that overweight and obese individuals are at risk for significant weight gain; however, this study also demonstrated that those in the underweight/normal BMI category are at risk.

Second, an exploration of the relationship between health responsibility and weight gain is needed. The HPLP II (Walker et al., 1995) has not been used in the college student population in the U.S., and replication of these findings is indicated, with a larger, and more demographically diverse, sample from more than one setting.

In addition, a study designed to more accurately measure the construct of health responsibility would be another potential area of research, since Walker et al. (1995) are the only researchers who have developed a research instrument using this construct. Producing an instrument that would extend the definition and operationalization of the construct of health responsibility, including the rigorous process of measuring and

validating a new instrument, could result in a better understanding of the relationship between health responsibility and weight change.

Third, longitudinal studies over the first year of college, and extending throughout the undergraduate experience, would generate additional information that could be used in future research studies. This could assist in determining if the same variables are implicated in weight change throughout the college experience, and if the pace of weight change is constant or changes over time.

Finally, since several of the instruments did not demonstrate adequate reliability coefficients, finding or creating instruments that would more accurately measure the constructs under study are also important areas for future study. Instruments that could more accurately measure the variables of sedentary behavior and beverage and snack intake are needed to determine their role in weight change in this population.

Implications for Nursing Practice

Evidence-based nursing practice integrates clinical expertise with current and best research information and is anchored by a strong theoretical framework in order to provide optimal nursing care. The knowledge gained from this study adds to the body of knowledge regarding weight gain in college freshmen by providing new findings about factors that may place students at high risk for significant weight gain.

In this study, those who entered college with a normal BMI gained weight at a faster pace than overweight and obese students. This finding of the higher incidence of weight gain in the underweight/normal BMI group in this study is noteworthy. In addition, it generates concern from a health perspective, since persons who are overweight or obese are at higher risk for development of chronic health problems. For

example, health risks associated with metabolic syndrome (hypertension, cardiovascular

disease, diabetes) are increased. In a previous study, Huang et al. (2004) calculated that

overweight college students have three times the risk of developing at least one

component of metabolic syndrome, compared with normal weight students. There is also

an increased risk for other chronic medical conditions, including asthma, sleep apnea,

menstrual irregularity, and infertility (Burke et al., 2009; Carnethon et al., 2004; Huang et

al., 2005; Huang et al., 2007; Sacheck et al., 2010).

In addition, a low level of Health Responsibility was related to weight gain.

College students are in the developmental stage of emerging adulthood, and they are

inexperienced in performing consistent healthy lifestyle behaviors. Therefore, assisting

college freshmen to develop a commitment to perform healthy behaviors, on a consistent

basis, is essential.

The first role of nursing, in this instance, is to assess the health care needs of

college students by examining their curent health status, current health-related behaviors,

the perceived barriers and benefits of healthy actions, and existing support systems.

Targeted interventions to improve the performance of healthy behaviors to attain, or

maintain, a healthy weight within the university environment needs to be developed, with

strategies to create stronger support systems, to improve the level of health responsibility,

and to perform healthy weight behaviors. Targeted education regarding how to improve

overall health responsibility, and to decrease health risk, would also need to be included

in the intervention phase.

While this study indicated that normal weight freshmen are at highest risk for

clinically significant weight gain, it is those who are overweight and obese who are at

highest risk for chronic health consequences related to obesity. Therefore, for all freshmen, an integrated intervention plan would include information to increase awareness of health risk, explore attitudes toward health promotion practices, provide specific health education content related to health promotion behaviors, and include interventions targeted to build perceived self-efficacy to perform regular and consistent healthy behaviors. These interventions would assist in preventing rapid weight gain, reduce risky socially-mediated behaviors, and improve health status overall.

Conclusion

In this study, college freshman were found to be at risk for clinically significant weight gain, with findings similar to previous research studies. Unchecked, this weight gain can lead to chronic health conditions associated with obesity (e.g., metabolic syndrome, asthma, and polycystic ovarian syndrome). Two predictors of weight gain over the first semester of college were identified, a low level of Health Responsibility and BMI category (underweight/normal BMI).

The other independent variables did not show a significant association with weight gain in this study (gender, race, ethnicity, height change, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, alcohol consumption, stress management, interpersonal relations, and spiritual growth). These factors have been studied previously to determine their influence on healthy lifestyle behaviors in older adolescents and college students; and the factors of gender, race, ethnicity, physical activity, sedentary behavior, nutritional intake, beverage and snack intake, and alcohol consumption have been studied specifically to determine if there is a relationship with weight change. There have been conflicting findings regarding significant association

between weight change with gender, race, ethnicity, and stress, so further research is indicated for these variables.

In addition, the discovery that a low level of Health Responsibility was related to weight gain indicates that students may not be performing health promotion activities that could reduce weight gain. Therefore, based on the results of this study, an effective intervention study targeting health responsibility perceptions and actions to perform healthy lifestyle behaviors is indicated. Measuring the commitment to a plan of action related to healthy behaviors would also be an important component for future study, based on Pender's HPM model (Pender et al., 2006).

In conclusion, the information gained in this study adds to the limited body of knowledge regarding the personal, interpersonal, and situational factors related to weight gain in college freshmen. The information presented in this study can be useful for university leaders and healthcare providers who work with the university student population, to provide direction for the implementation of health-related interventions at the university level to decrease the risk of weight gain. The findings from this study can also direct future research to explore the phenomenon of freshman weight gain in greater depth and to design studies that decrease the risk of precipitate weight gain in the freshman year of college.

APPENDICES

APPENDIX A: Consent Form

The University of New Mexico Health Sciences Center
Consent to Participate in Research

Weight Change in College Freshmen:
Personal, Interpersonal and Situational Influences

Purpose and General Information

You are being asked to participate in a research study that is being done by Elizabeth Tigges, PhD, RN, PNP-BC who is the Principal Investigator, and Kristin Kuhlmann, PhD(c), RN, FNP-BC, as the Co-Investigator, as part of her dissertation requirements through the University of New Mexico College of Nursing. This research is being done to evaluate factors that influence weight change in college freshmen. You are being asked to participate because as an entering freshman, you can provide information that will be helpful in this area of study. Approximately 280 people will take part in this study at Eastern New Mexico University, Portales, NM.

This form will explain the study to you, including the possible risks as well as the possible benefits of participating. This is so you can make an informed choice about whether or not to participate in this study. Please read this Consent Form carefully. Ask the investigators or study staff to explain any words or information that you do not clearly understand.

What will happen if I participate?

If you agree to be in this study, you will be asked to read and sign this Consent Form. After you sign the Consent Form, the following things will happen:

You will be given a Study Identification Card, with a unique study ID number contained on the card, along with contact information for the local Co-Investigator, Kristin Kuhlmann, PhD(c), RN, FNP-BC. You will need this ID number for the two height and weight measurement sessions at the beginning and the end of the 2011 fall semester, and two administrations of an on-line survey, also conducted at the beginning and end of the fall semester.

In the first and fifteenth week of the 2011 fall semester, your height and weight measures will be obtained by the Co-Investigator or a research assistant. From this data, your body mass index will also be calculated. Each height/weight measurement session will be approximately 50 minutes in length; the time you will be present should be no more than 15-20 minutes. Your Freshman Orientation instructor will allow you to participate in these two measuring sessions during your normal class times for the Freshman Orientation course. However, if you decide not to participate in the study, or withdraw from the study at any time, this will not influence your grade in Freshman Seminar in any way.

The on-line, self-administered survey will be available on the Survey Monkey web portal during weeks 2-3 and again in weeks 15-16 of the 2011 fall semester. This site is accessible from any

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computer that has internet access, and each participant will be provided with the web-link for the survey through the email address you provide. The Health and Lifestyle Profile (HeLP) survey will take approximately 30-45 minutes to complete for each administration. No other student will be able to see your answers. Only you, the Co-Investigator, and research staff will be able to see your responses. In addition, the information you provide on the survey will be anonymous, only identified by the Study ID number, not by your name or other form of identification. You can choose to skip questions, or chose not to respond to survey questions.

Participation in this study will take a total of 3-1/2-to-4 hours over a period of 16 weeks, the 2011 fall semester.

What are the possible risks or discomforts of being in this study?

Every effort will be made to protect the information you give us. However, there is a small risk of loss of confidentiality that may result in inadvertent release of personal information or height, weight, or body mass index. There is also a small risk of stress, emotional distress, and inconvenience. Some participants may be embarrassed or uncomfortable with being weighed, or may not want to fully divulge lifestyle behaviors on the survey. Privacy screens will be placed around the height/weight stations to reduce the risk for loss of privacy. Additionally, if you choose to decline in any measurement procedure, you may withdraw from the study at any time, without penalty. If you would like to talk to a mental health counselor, the Co-Investigator will refer you to ENMU counseling services, at no cost to you.

How will my information be kept confidential?

Your name and other identifying information will be maintained in locked files, available only to authorized members of the research team, for the duration of the study. For any information entered into a computer, except for the study roster, the only identifier will be the unique study ID number assigned to you. All information on the computer files will be password protected, and only the investigators and authorized personnel will have access to the password. Any personal identifying information and any record linking that information to study ID numbers will be destroyed when the study is completed. Information resulting from this study will be used for research purposes and may be published; however, you will not be identified by name in any publications.

Information from your participation in this study may be reviewed by the Principal Investigator, UNM College of Nursing research officials, federal and state regulatory agencies, and by the UNM Human Research Review Committee (HRRC) which provides regulatory and ethical oversight of human research.

What are the benefits to being in this study?

There may or may not be direct benefit to you from being in this study. However, your participation may help find out what factors influence weight change in college freshmen.

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What other choices do I have if I don't participate?

Taking part in this study is voluntary so you can choose not to participate.

Will I be paid for taking part in this study?

Upon satisfactory completion of the second survey and second height and weight measure, you will be provided with a $10 Visa card in appreciation of your participation. You will not receive this card if you do not complete both height/weight measures and both surveys. This is a small incentive, and not payment for participating in the study.

Can I stop being in the study once I begin?

Yes. You can withdraw from this study at any time without affecting your grades or academic standing at ENMU. You may withdraw at any time, without adverse consequences to you.

The investigators have the right to end your participation in this study if they determine that you no longer qualify to take part, if you do not follow study procedures, or if it is in your best interest or the study's best interest to stop your participation.

HIPAA SECTION (FOR INCLUSION IN STUDIES THAT REQUIRE COLLECTION OF PHI)

Authorization for Use and Disclosure of Your Protected Health Information (HIPAA)

As part of this study, we will be collecting health information about you and sharing it with others. This information is "protected" because it is identifiable or "linked" to you. However, a strict confidentiality process will be maintained and data collected in the study will only be reported as group information.

Protected Health Information (PHI)

By signing this Consent Document, you are allowing the investigators and other authorized personnel to use your protected health information for the purposes of this study. This information may include: your height, weight, and body mass index.

In addition to researchers and staff at UNMHSC and other groups listed in this form, there is a chance that your health information may be shared (re-disclosed) outside of the research study and no longer be protected by federal privacy laws. Examples of this include disclosures for law enforcement, judicial proceeding, health oversight activities and public health measures.

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Right to Withdraw Your Authorization

Your authorization for the use and disclosure of your health information for this study shall not expire unless you cancel this authorization. Your health information will be used or disclosed as long as it is needed for this study. However, you may withdraw your authorization at any time provided you notify the UNM investigators in writing. To do this, please send a HIPAA Research Withdrawal letter to:

Ms. Kristin L. Kuhlmann, Co-Investigator   or   Dr. Elizabeth Tigges, Principal Investigator
ENMU College of Nursing   UNM College of Nursing
1500 S. Ave K., Station #4   MSC 095350
Portales, NM 88130   1 University of New Mexico
                                                     Albuquerque, NM 87131

Please be aware that the research team will not be required to destroy or retrieve any of your health information that has already been used or shared before your withdrawal is received.

Refusal to Sign

If you choose not to sign this consent form and authorization for the use and disclosure of your PHI, you will not be allowed to take part in the research study.

What if I have questions or complaints about this study?

If you have any questions, concerns or complaints at any time about the research study, you may contact Dr. Elizabeth Tigges at 505-272-8158, or the Co-Investigator, Ms. Kristin Kuhlmann at 575-562-2145 anytime during the 2011 fall semester. If you would like to speak with someone other than the research team, you may call the Human Research Review Committee (HRRC) at (505) 272-1129. The HRRC is a group of people from UNM and the community who provide independent oversight of safety and ethical issues related to research involving human subjects.

What are my rights as a research subject?

If you have questions regarding your rights as a research subject, you may call the HRRC at (505) 272-1129 or visit the HRRC website at http://hsc.unm.edu/som/research/hrrc/.

Consent and Authorization

You are making a decision whether to participate in this study. Your signature below indicates that you read the information provided (or the information was read to you). By signing this Consent Form, you are not waiving any of your legal rights as a research subject.

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I have had an opportunity to ask questions and all questions have been answered to my satisfaction. By signing this Consent Form, I agree to participate in this study and give permission for my health information to be used or disclosed as described in this Consent Form. A copy of this Consent Form will be provided to me.

_____   _____/_____

Name of Adult Participant (print)   Signature of Adult Participant   Date

After reading this consent form thoroughly, and having all questions or concerns addressed, please print your name, sign the consent, and write the date on the lines indicated above. Once signed, give the consent form to a research team member. You will be provided with an unsigned copy of the consent form at that time. Thank you for consenting to participate in this study.

I have explained the research to the subject and answered all of his/her questions. I believe that he/she understands the information in this consent form and freely consents to participate.

_____   _____/_____

Name of Research Team Member   Signature of Research Team Member/Date

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APPENDIX B: Study Forms

Study Identification Card

Study Identification Number: 000
  Name of Study: Weight Change in College Freshmen

    If you have any questions about the study, please call the co-investigator, Ms. Kuhlmann, during business hours, Monday through Friday, at 575-562-2145. You may also email Ms. Kuhlmann at kristin.kuhlmann@enmu.edu. To contact the Principal Investigator, you may reach Dr. Elizabeth Tigges at 505-272-1129, or by email at btigges@salud.unm.edu.
    You may withdraw from this study at any time, without any risk to you. Please notify us if you wish to withdraw. Please retain this card until the study is completed. You will need the ID number to complete the survey and for the height and weight measurements. Thank you.

The study identification number and contact information were printed on 2" x 3-1/2" white business card stock, with a unique study identification number on each card, ranging from 101 to 380. The colors, font, and type sizes, as shown, are identical to the cards given to participants. The cards were laminated for durability and then each card was cut to the original business card size.

Contact Information Form

Please provide all information requested on this form.

Name: _____ **Date of Birth:** _____
                                                                    (Month/day/year)

Study ID Number: _____ **Phone number:** _____

Personal email address: _____

This information will be kept confidential and will not be provided to anyone who is not associated with the administration of this research study. Thank you.

Height and Weight Form

Please complete the following information before your height and weight are collected:

Today's date: _____ Study ID #: _____ Date of Birth: _____

(Month/day/year)

Gender: ____Male   ____ Female

This information will be kept confidential and will not be provided to anyone who is not associated with the administration of this research study. Thank you.

Please proceed to the height/weight station for measurement.

For Research staff only:

_____T1   _____T2

Height to nearest 1/8 inch: _____

Weight to nearest 1/10 pound: _____

The following measure will be calculated using the BMI Calculator for Child & Teen, http://apps.nccd.cdc.gov/dnpabmi/

BMI _____   BMI percentile: _____

Weight (Digital Scale) and Height (Stadiometer) Log

Each day, or each time the scales and stadiometers are moved, obtain the weight and height on the same person for both scales and both stadiometers. Measure weight to the nearest 1/10th (0.1) pound and measure height to the nearest 1/8th inch.

If the two scales do not measure the two weights of the same person exactly to 1/10th (0.1) pound (lb.), weigh another person on both scales. If the scales vary again, elect to use only one scale for that day's weight collection and indicate, on the log, which is being used.

If the two stadiometers do not measure the heights of same person exactly to the 1/8th inch, measure another person on both stadiometers. If the stadiometers vary again, elect to use only one stadiometer for that day's height measurements and indicate, on the log, which is being used.

Date and Time	Scale #1: Weight (lbs.) to 0.1 lb.	Scale #2: Weight (lbs.) to 0.1 lb.	Stadiometer #1: Height (inches) to 1/8th inch	Stadiometer #2: Height (inches) to 1/8th inch	Comment if measurement not matching

We need your help!

We are looking for ENMU freshmen volunteers to participate in a research study related to weight change in college freshmen.

If you are:

*Between 18-19 years old,

*Have never attended college before,

*Live in campus housing,

*Don't have children,

*Aren't pregnant, and

*Have purchased the Sodexo meal plan,

We want to talk with you. We will meet with students who are interested in participating in this study during one of your scheduled Freshman Seminar classes next week. Your instructor will tell you which day. Participation is voluntary; there will be no impact on your grade if you decide not to participate.

Here's what will happen:

1. We'll tell you about the study and ask you to sign a consent. If you say yes:

2. We'll take your height and weight next week and the last week of this semester (the 2nd and 15th week of the semester).

3. You'll fill out an on-line survey next week and the last week of this semester.

That's it! Oh, did we mention that every student who completes the study will get a $10 Visa Card?

It's true! So, come and find out more next week.

APPENDIX C: Health and Lifestyle Profile (HeLP) Survey

To review the study consent form click here.

Instructions: Please complete the survey below. All responses are kept confidential and will only be matched with your Study ID number, not your name or other identifying information. You may skip, or elect not to answer questions on the survey.

1. Please enter your 3-digit Study ID number here. My study ID number is:

Part 1. Demographics

2. Gender

I am:

◯ Male

◯ Female

3. Females only, please respond:

Are you currently pregnant?

◯ Yes

◯ No

4. Do you consider yourself to be Hispanic/Latino (UNM, n.d.)

◯ Yes

◯ No

5. In addition, select one or more of the following racial categories to describe yourself:

☐ American Indian or Alaska Native

☐ Asian

☐ Black or African American

☐ Native Hawaiian or Pacific Islander

☐ White

☐ Other

Questions 6-25. Please answer these questions about food and snacks you eat and drink.

(Neuhouser et al., 2009)

6. Over the past week, how many times did you drink the following:

Orange juice, apple juice, and other 100% juice?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

7. Over the past week, how many times did you drink the following:

Fruit Drinks such as Snapple, Capri Sun, and Kool-aid?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

8. Over the past week, how many times did you drink the following:

Sports drinks such as Gatorade and PowerAde?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

9. Over the past week, how many times did you drink the following:

Flavored waters such as Propel or vitamin-fortified waters?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

10. Over the past week, how many times did you drink the following:

Diet soda or pop?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

11. Over the past week, how many times did you drink the following:

Regular soda or pop?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

12. Over the past week, how many times did you drink the following:

Energy drinks such as RockStar, Red Bull, Monster, and Throttle?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

13. Over the past week, how many times did you drink the following:

1% or nonfat milk?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

14. Over the past week, how many times did you drink the following:

Regular or 2% milk (whole or reduced fat)?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

15. Over the past week, how many times did you eat the following:

Low-fat or nonfat potato chips, tortilla chips, and corn chips?

- ◯ Never/less than once per week
- ◯ 1 per week
- ◯ 2-4 per week
- ◯ 5-6 per week
- ◯ 1 per day
- ◯ 2-3 per day
- ◯ 4+ times/day

16. Over the past week, how many times did you eat the following:

Regular potato chips, tortilla chips, puffs, and corn chips?

- ◯ Never/less than once per week
- ◯ 1 per week
- ◯ 2-4 per week
- ◯ 5-6 per week
- ◯ 1 per day
- ◯ 2-3 per day
- ◯ 4+ times/day

17. Over the past week, how many times did you eat the following:

Salty snacks such as Cheese Nibs, Chex mix, and Ritz Bits?

- ◯ Never/less than once per week
- ◯ 1 per week
- ◯ 2-4 per week
- ◯ 5-6 per week
- ◯ 1 per day
- ◯ 2-3 per day
- ◯ 4+ times/day

18. Over the past week, how many times did you eat the following:

Candy, including chocolate, Jelly Bellies, gummies, and Life Savers?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

19. Over the past week, how many times did you eat the following:

Doughnuts, Pop-Tarts, breakfast pastries?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

20. Over the past week, how many times did you eat the following:

Cookies, brownies, pies, and cakes?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

21. Over the past week, how many times did you eat the following:

Low-fat or nonfat frozen desserts such as low-fat ice cream and frozen yogurt?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

22. Over the past week, how many times did you eat the following:

Regular ice cream and milkshakes

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

23. Over the past week, how many times did you eat the following:

Vegetables, including green salad, peas, green beans, corn (not including fried potatoes or french fries)?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

24. Over the past week, how many times did you eat the following:

Fruit, such as banana, apple, or grapes (do not include juice)?

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

25. Over the past week, how many times did you consume food or drink from a snack/coffee bar, convenience store, or fast food restaurant?(Not part of established instrument, omitted from data analysis).

◯ Never/less than once per week

◯ 1 per week

◯ 2-4 per week

◯ 5-6 per week

◯ 1 per day

◯ 2-3 per day

◯ 4+ times/day

Questions 26-31. Now, we would like to ask you about your drinking patterns with alcohol. (Engs, 2007)

26. Let's take beer first. How often, on the average, do you usually have a beer?

◯ 1. Every day

◯ 2. At least once a week but not every day

◯ 3. At least once a month but less than once a week

◯ 4. More than once a year but less than once a month

◯ 5. Once a year or less/never

27. When you drink beer, how much, on the average, do you usually drink at any one time?

◯ 1. More than one six pack (6 or more cans or tavern glasses)

◯ 2. 5 or 6 cans of beer or tavern glasses

◯ 3. 3 or 4 cans of beer or tavern glasses

◯ 4. 1 or 2 cans of beer or tavern glasses

◯ 5. Less than 1 can of beer or tavern glass/ none

28. Now let's look at table wine. How often do you usually have wine?

○ 1. Every day

○ 2. At least once a week but not every day

○ 3. At least once a month but less than once a week

○ 4. More than once a year but less than once a month

○ 5. Once a year or less/ never

29. When you drink wine, how much, on average, do you usually drink at any one time?

○ 1. Over 6 wine glasses

○ 2. 5 or 6 wine glasses

○ 3. 3 or 4 wine glasses

○ 4. 1 or 2 wine glasses

○ 5. Less than 1 glass of wine/ none

30. Next we would like to ask you about liquors or spirits (whiskey, gin, vodka, mixed drinks, etc.). How often do you usually have a drink of liquor?

○ 1. Every day

○ 2. At least once a week but not every day

○ 3. At least once a month but less than once a week

○ 4. More than once a year but less than once a month

○ 5. Once a year or less/ never

31. When you drink liquor, how may drinks, on the average, do you usually drink at any one time?

○ 1. Over 6 drinks

○ 2. 5 or 6 drinks

○ 3. 3 or 4 drinks

○ 4. 1 or 2 drinks

○ 5. Less than 1 drink/ none

Questions 32-83. Please indicate how often you do each of these activities (Walker et al, 1995).

32. Discuss my problems and concerns with people close to me.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

33. Choose a diet low in fat, saturated fat, and cholesterol.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

34. Report any unusual signs or symptoms to a physician or other health professional.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

35. Follow a planned exercise program.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

36. Get enough sleep.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

37. Feel I am growing and changing in positive ways.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

38. Praise other people easily for their achievements.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

39. Limit use of sugars and food containing sugar (sweets).

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

40. Read or watch TV programs about improving health.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

41. Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

42. Take some time for relaxation every day.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

43. Believe that my life has purpose.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

44. Maintain meaningful and fulfilling relationships with others.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

45. Eat 6-11 servings of bread, cereal, rice and pasta every day.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

46. Question health professionals in order to understand their instructions.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

47. Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times per week).

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

48. Look forward to the future.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

49. Accept those things in my life which I cannot change.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

50. Spend time with close friends.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

51. Eat 2-4 servings of fruit each day.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

52. Get a second opinion when I question my health care provider's advice.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

53. Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

54. Concentrate on pleasant thoughts at bedtime.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

55. Feel content and at peace with myself.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

56. Find it easy to show concern, love, and warmth to others.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

57. Eat 3-5 servings of vegetables each day.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

58. Discuss my health concerns with health professionals.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

59. Do stretching exercises at least 3 times per week.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

60. Use specific methods to control my stress.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

61. Work toward long-term goals in my life.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

62. Touch and am touched by people I care about.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

63. Eat 2-3 servings of milk, yogurt or cheese each day.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

64. Inspect my body at least monthly for physical changes/danger signs.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

65. Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parking car away from destination and walking).

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

66. Balance time between work and play.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

67. Find each day interesting and challenging.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

68. Find ways to meet my needs for intimacy.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

69. Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

70. Ask for information from health professionals about how to take good care of myself.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

71. Check my pulse rate when exercising.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

72. Practice relaxation or meditation for 15-20 minutes daily.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

73. Am aware of what is important to me in life.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

74. Get support from a network of caring people.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

75. Read labels to identify nutrients, fats, and sodium content in packaged food.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

76. Attend educational programs on personal health care.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

77. Reach my target heart rate when exercising.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

78. Pace myself to prevent tiredness.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

79. Feel connected with some force greater than myself.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

80. Settle conflicts with others through discussion and compromise.

○ 1. Never

○ 2. Sometimes

○ 3. Often

○ 4. Routinely

81. Eat breakfast.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

82. Seek guidance or counseling when necessary.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

83. Expose myself to new experiences and challenges.

◯ 1. Never

◯ 2. Sometimes

◯ 3. Often

◯ 4. Routinely

Questions 84-89. The next series of questions are about how much time you spend on the following activities (Utter et al., 2003)**.**

84. In your free time on an average weekday (Monday-Friday), how many hours do you spend . . .

Watching TV & videos

◯ 1. None

◯ 2. 1/2 hour

◯ 3. 1 hour

◯ 4. 2 hours

◯ 5. 3 hours

◯ 6. 4 hours

◯ 7. 5+ hours

85. In your free time on an average weekday (Monday-Friday), how many hours do you spend . . .

Reading and doing homework

○ 1. None
○ 2. 1/2 hour
○ 3. 1 hour
○ 4. 2 hours
○ 5. 3 hours
○ 6. 4 hours
○ 7. 5+ hours

86. In your free time on an average weekday (Monday-Friday), how many hours do you spend . . .

Using a computer (not for homework)

○ 1. None
○ 2. 1/2 hour
○ 3. 1 hour
○ 4. 2 hours
○ 5. 3 hours
○ 6. 4 hours
○ 7. 5+ hours

87. In your free time on an average weekend day (Saturday or Sunday), how many hours do you spend . . .

Watching TV & videos

○ 1. None
○ 2. 1/2 hour
○ 3. 1 hour
○ 4. 2 hours
○ 5. 3 hours
○ 6. 4 hours
○ 7. 5+ hours

88. In your free time on an average weekend day (Saturday or Sunday), how many hours do you spend . . .

Reading and doing homework

○ 1. None

○ 2. 1/2 hour

○ 3. 1 hour

○ 4. 2 hours

○ 5. 3 hours

○ 6. 4 hours

○ 7. 5+ hours

89. In your free time on an average weekend day (Saturday or Sunday), how many hours do you spend . . .

Using a computer (not for homework)

○ 1. None

○ 2. 1/2 hour

○ 3. 1 hour

○ 4. 2 hours

○ 5. 3 hours

○ 6. 4 hours

○ 7. 5+ hours

Before pressing the "DONE" button below, please confirm that you have answered all questions on this survey. You may skip, or elect not to answer questions without consequence to you. Thanks.

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