PERCEPTIONS ABOUT OVERWEIGHT AND OBESITY AMONG COLLEGE STUDENTS: APPLICATION OF THE HEALTH BELIEF MODEL

A Thesis
by
ALYSSE RIGGS

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Abstract

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Rates of overweight/obesity among U.S. college students are increasing. This cross-sectional survey study assessed the perceived weight status and weight-related beliefs of 560 undergraduate and graduate students (399 females, 71.8% and 158 males, 28.4%) attending Appalachian State University in Boone, North Carolina during the 2015-2016 academic year. The Health Belief Model (HBM) was used as the framework for data analysis. Surveys were administered using Qualtrics survey software. Items assessed perceived body weight, perceived susceptibility and severity of becoming overweight/obese, and perceived barriers, benefits, and internal and external cues to adopting healthy eating and physical activity habits. Data analysis: Frequencies and percents were obtained on demographic data, means (SD) were calculated for HBM variables, and chi-square analyses compared student groups. Statistical significance was $p \leq 0.05$. The results of this study suggested that 196 students (22.7%) perceived themselves as overweight, while 27 students (3.1%) perceived themselves as obese. The students' mean score on the perceived severity scale was 3.8 points (± 0.8) out of a possible five points, while their mean score on the perceived susceptibility scale was 3.5 points (± 0.9). Barriers from the

practical concerns subscale received the greatest number of 4 and 5 ratings (on a five-point scale), with a mean of 3.0, indicating that these were perceived as stronger obstacles for adopting healthy eating and physical activity habits. Benefits from the emotional/mental health subscale received the greatest number of 4 and 5 ratings, with a mean score of 4.3, indicating that they were perceived as more desirable outcomes from adopting healthy eating and physical activity habits. In conclusion, nutrition education interventions for college students should offer assistance with managing emotional/mental health problems, emphasize the benefits of practicing healthy eating and physical activity habits for long-term health promotion, and teach skill-building for overcoming perceived barriers to adopting healthy dietary and physical activity behaviors.

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Dedication

This thesis is dedicated to Dr. Laura McArthur, a passionate woman who believed in me from the start. I couldn't have succeeded without you. Thank you for everything.

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Chapter One: Introduction

1.1 Prevalence of Overweight and Obesity in the United States

According to the National Institutes of Health, body mass index (BMI) is a measure of body fat for adult men and women based on height and weight ("Calculate Your Body Mass Index," 2016). The term “overweight” is defined as a body mass index (BMI) between 25.0 to 29.9 kg/m^2, and “obesity" is defined as a BMI at or above 30.0 kg/m^2. Additionally, there are grade categories of obesity as follows: a BMI of 30-34.9 is class I obesity, a BMI of 35.0-39.9 is class II obesity, and a BMI of 40.0 or greater is class III obesity ("Defining Adult Overweight and Obesity ", 2012). The BMI measurement is frequently used in clinical and research settings to identify persons with excess adiposity, since a high BMI can be predictive of high body fat.

More than one-third (78.6 million) adults in the United States are considered obese, and 69% of adults aged 20 years and older are considered overweight and obese ("Adult Obesity Facts," 2015). Obesity rates are higher among adults aged 50-59 years, and non-Hispanic blacks have the highest age-adjusted rates of obesity ("Adult Obesity Facts," 2015). Additionally, approximately 12.7 million children and adolescents aged 2-19 are obese. According to the National Health and Nutrition Examination Survey (NHANES) data (Flegal, Carroll, Kit, & Ogden, 2012), there has not been an significant change in the prevalence in obesity from 1999 to 2010 for women, but there may be a slight increase of prevalence among men. Obesity rates also varied among race/ethnic groups, and statistically significant differences in obesity trends emerged between non-Hispanic black women and Hispanic women. Finally, the prevalence of overweight/obesity among college students aged 19-24 has increased from 31.9% 2008 ("American College Health Association– National College Health Assessment Spring 2008 Reference Group Data Report-Abridged," 2008) to 40.8% in 2015 ("American College Health

Association-National College Health Assessment II: Reference Group Executive Summary Spring 2015,") according to the American College Health Association.

1.2 Problem Statement and Justification

This cross-sectional quantitative survey research measured the perceptions, behaviors, and knowledge about overweight and obesity among a random sample of undergraduate and graduate students enrolled at Appalachian State University (ASU) during the 2015-2016 academic year. Perception data collection was guided by the constructs from the Health Belief Model (HBM), i.e., perceived barriers and benefits of adopting healthy eating and physical activity habits to achieve a healthy weight, perceived severity and susceptibility associated with overweight/obesity, and internal/external cues to action for adopting healthy eating and physical activity habits. Associations between the HBM constructs and the students' demographic characteristics were also investigated, and the students' weight loss attempts and knowledge of topics related to overweight/obesity were assessed.

Given that data from the Centers for Disease Control and Prevention (CDC) and from the NHANES indicate an increasing prevalence of overweight/obesity among college-aged populations, findings from this study will help nutrition educators on the ASU campus design interventions aimed at helping students overcome the perceived barriers that are preventing them from adopting healthy eating and physical activity behaviors. These interventions could be guided by the perceived benefits identified by the participants as those they most strongly associated with healthy eating and regular physical activity, and the primary internal/external cues to action that would motivate them to adopt these habits.

1.3 Study Hypotheses

The following subsections list the sets of hypotheses focusing on weight-related behaviors, attitudes, and knowledge variables, and on the five constructs from the Health Belief Model (HBM) that were tested in this research.

1.3.1 Hypotheses Concerning Weight-Related Behaviors, Attitudes, and Knowledge

1) A significantly greater proportion of females than males will have attempted weight loss during the previous 12 months.

2) A significantly greater proportion of females than males will be dissatisfied/very dissatisfied with their current weight.

3) A significantly greater proportion of females than males will perceive their weight status as overweight/obese.

4) Females will earn a significantly higher mean score than males on the overweight/obesity knowledge test.

5) Students who had taken a college/university-level nutrition course will earn a significantly higher mean score on the overweight/obesity knowledge test than students who had not taken such a course.

6) Students majoring in a physical or mental health-related discipline will earn a significantly higher mean score on the overweight/obesity knowledge test than students majoring in other disciplines.

7) Third/fourth year students will earn a significantly higher mean score than first/second year students on the overweight/obesity knowledge test.

1.3.2 Hypotheses Concerning Perceived Severity of Becoming Overweight/Obese

1) There will be no significant gender-based difference between the mean scores on the perceived severity scale.

2) There will be a significant inverse correlation between the students' BMIs and their scores on the perceived severity scale.

3) Students who had taken a college/university-level nutrition course will earn a significantly higher mean score on the perceived severity scale than students who had not taken such a course.

4) Students majoring in a physical or mental health-related discipline will earn a significantly higher mean score on the perceived severity scale than students majoring in other disciplines.

5) Third/fourth year students will earn a significantly higher mean score than first/second year students on the perceived severity scale.

1.3.3 Hypotheses Concerning Perceived Susceptibility to Becoming Overweight/Obese

1) Females will earn a significantly higher mean score than males on the perceived susceptibility scale.

2) There will be a significant inverse correlation between the students' BMI and their scores on the perceived susceptibility scale.

3) Students majoring in a physical or mental health-related discipline will earn a significantly higher mean score on the perceive susceptibility scale than students majoring in other disciplines.

4) First/second year students will earn a significantly higher mean score than third/fourth year students on the perceive susceptibility scale.

1.3.4 Hypotheses Concerning Perceived Barriers to Adopting Healthy Eating and Physical Activity Habits

1) Females will earn a significantly higher mean score than males on the perceived barriers scale.

2) First/second year students will earn a significantly higher mean score than third/fourth year students on the perceived barriers scale.

3) Students majoring in a physical or mental health-related discipline will earn a significantly lower mean score on the perceived barriers scale than students majoring in other disciplines.

4) Students who had taken a college/university-level nutrition course will earn a significantly lower mean score on the perceived barriers scale than students who had not taken such a course.

5) There will be a significant positive correlation between the students' BMIs and their scores on the overall perceived barriers scale.

1.3.5 Hypotheses Concerning Internal and External Cues to Adopting Healthy Eating and Physical Activity Habits

1) Females will earn a significantly higher mean score than males on the internal cues scale.

2) There will be significant inverse correlations between the students' BMIs and their scores on the internal and external cues scales.

3) There will be no significant differences in the mean scores on either the internal cues scale or on the external cues scale between first/second and third/fourth year students.

1.3.6 Hypotheses Concerning Perceived Benefits of Adopting Healthy Eating and Physical Activity Habits

1) There will be no significant gender-based difference in the mean scores on the perceived benefits scale.

2) Students majoring in a physical or mental health-related discipline will earn a significantly higher mean score on the perceived benefits scale than students majoring in other disciplines.

3) There will be a significant inverse correlation between the students' BMIs and their scores on the perceived benefits scale.

Chapter Two: Literature Review

2.1 Prevalence of Overweight and Obesity in the United States

2.1.1 Overweight and Obesity Among Children and Adolescents

Ogden, Carroll, Kit, and Flegal (2012) surveyed 4,111 children and adolescents in the United States to estimate obesity prevalence in U.S. children and adolescents from 1999 to 2000, and to investigate trends in obesity prevalence among children and adolescents from 2009 to 2010. Data were from NHANES, which consisted of responses to an at-home interview, findings from a physical examination, and weight and height measurements. Data collection began in 1999 and findings have been released in 2-year cycles. Overweight for children and adolescents age 2-19 years was defined as a BMI between the 85th to the 94th percentiles for age and gender, while obesity was defined as a BMI above the 95th percentile. The mean and median BMI for sex-specific age groups (2-5 years, 6-11 years, and 12-19 years) were analyzed for 6 survey periods from 1999-2000, 2001-2002, 2003-2004, 2005-2006, 2007-2008, and 2009-2010. Statistics were performed using Statistical Analysis Software (SAS), and statistical significance for trends over time was set at $p < 0.05$. Out of the total 4111 children measured, 1,376 were non-Hispanic white, 792 were non-Hispanic black, and 1,660 were Hispanic children and adolescents. The findings revealed that 16.9% of children and adolescents aged 2 through 19 years were obese in 2009-2010, 31.8% were either overweight or obese, and 12.3% were at or above the 90th percentile of BMI for age and gender. For male children and male adolescents, the prevalence of obesity was significantly higher than among female children and female adolescents. The prevalence of obesity between males and females was also considered high among non-Hispanic white children. Additionally, the prevalence of obesity from 2009-2010 was 12.1% among children aged 2-5 years, 18.0% among children aged 6-11 years, and 18.4%

among children and adolescents aged 12-19 years. Approximately 13.9% of children and adolescents aged 12-19 years met the adult definition of obesity with a BMI of 30.0 or greater. Finally, over the past 12 years, the odds of being obese were significantly higher for non-Hispanic black and Mexican American males and females compared to non-Hispanic white males and females. Furthermore, there was a significant trend in the prevalence of obesity between 1999-2000 and between 2009-2010 among male children and adolescents aged 2-19 years. Research indicates that the prevalence of obesity continues to be higher among non-Hispanic black and Hispanic children and adolescents than among non-Hispanic white children, but it is not clear if BMI is a strong predictor of obesity-related health issues in the future.

A study on the differential trends of obesity over time among lower-income adolescents in relation to higher-income adolescents was performed by Babey, Hastert, Wolstein, and Diamant (2010). Data were collected from the California Health Interview Survey (CHIS), which was a random-digit/dial telephone survey. Approximately 17,535 responses from adolescents aged 12-17 were collected from CHIS in 2001, 2003, 2005, and 2007. Additionally, BMI for adolescents aged 12-17 and family income were measured as well. Family income was divided into three categories reflecting below 100%, 100% to 229%, or 300% or more of the federal poverty level. All data were analyzed using SAS and Survey Data Analysis (SUDAAN). The results reflected an obesity prevalence in 2001 that was 70% higher among adolescents with family incomes below the poverty line than among those whose family incomes were 300% or more of the federal poverty level. Additionally, in 2007, the prevalence of obesity among adolescents was 128% higher in the lowest income group than in the highest income group. The results of a regression model also suggested that trends in obesity among adolescents in the lowest income group were different from trends among those in the highest income group, and

that male adolescents were more likely to be obese than female adolescents. Furthermore, African American and Latino adolescents were more likely to be obese than white adolescents, and Asian adolescents were less likely to be obese than white adolescents. Overall, the results indicated that there were no statistically significant differences in obesity prevalence between 2001-2007, but each survey year indicated an inverse relationship between family income and obesity prevalence. The findings also suggested that male obesity rates were higher than female rates overall all income groups. The results also suggested that the trend of increasing disparity in obesity is continuing, and that lower-income adolescents are at risk for adulthood obesity and related comorbidities such as type 2 diabetes, hypertension, heart disease, and stroke.

Stettler, Kumanyika, Katz, Zemel, and Stallings (2003) investigated whether a pattern of rapid weight gain during early infancy is a risk factor for the development of adult obesity in young adult African Americans by conducting a prospective cohort study of 300 African Americans. The researchers followed these participants from birth to 20 years of age and measured the following variables: sex, gestational age birth order, year of birth, weight, length (or height) at each assessment, exact age at each assessment, and triceps and subscapular skinfold thicknesses. The researchers defined obesity as a BMI $\geq$ 30, overweight-overfat as a BMI $\geq$ 25, and skinfold thickness as the 85th percentile. The results indicated that 21 subjects were both obese and overweight-overfat, 3 were obese but not overweight-overfat, and 4 were overweight-overfat but not obese. The remaining 272 subjects were neither obese nor overweight-overfat. Additionally, 86 subjects had rapid weight gain during early infancy, 12 became obese adults, and the 12 of the 214 subjects without rapid weight gain during infancy became obese adults. Six of the twelve subjects with rapid weight gain during infancy who became obese were overweight at age 7, and the other 6 were not. Furthermore, 15% of subjects

with and 6% without rapid weight gain during infancy became overweight-overfat in young adulthood. Finally, overweight status in childhood was associated with adult obesity and overweight-overfat status. Overall, the researchers concluded that these findings could suggest that early infancy may represent a critical period for the development of adulthood obesity, especially in African American.

2.1.2 Overweight and Obesity Among Women

A prospective cohort study by Hu, Li, Colditz, Willett, and Manson (2003) examined the relationship between sedentary behavior such as watching TV and the risk of obesity and type 2 diabetes in women. The researchers obtained participants that were enrolled in the Nurses' Health Study and gathered data from 50,277 women for analysis. The researchers excluded women with diagnosed cardiovascular disease (CVD), cancers, or diabetes, and those who were obese. The participants reported their average weekly time spent sitting at home while watching TV, sitting at work or away from home or while driving, and other sitting at home activities, as well as time spent standing or walking around at home or at work. They were also asked to report the amount of time spent on average per week on a select number of physical activities. Body weight was self-reported, and a supplementary questionnaire, diagnostic tests, and hypoglycemic therapy were used diagnosis of diabetes. All data were analyzed using SAS, and statistical significance was $p \leq 0.05$. The findings indicated that women who spent more time watching television were more likely to smoke and drink alcohol and less likely to exercise. Additionally, these women also had higher intakes of total energy, total and saturated fats, red meat, processed meat, refined grains, snacks, and sweets, and lower intakes of fish, fruits, vegetables, and whole grains. After a six year follow up, 3,757 women who were not obese at baseline became obese in 1998. The findings suggested that time spent watching television was

positively associated with risk of obesity. Additionally, 1,515 women were newly diagnosed with type 2 diabetes after a six year follow up. Along with other sedentary behaviors, time spent watching television was strongly associated with an elevated risk of developing type 2 diabetes. Overall, the findings suggested that 30% of obesity cases and 43% of type 2 diabetes cases could have been potentially prevented by following a somewhat active lifestyle, as results indicated that even light activities such as standing or walking around the house were associated with a significantly lower risk of obesity and diabetes.

2.1.3 Overweight and Obesity Among Racial/Ethnic Groups

James Fowler-Brown, Raghunathan, and Van Hoewyk (2006) studied the prevalence of obesity in 679 African American Women living in Pitt County, North Carolina and examined the independent association between childhood and adulthood socioeconomic position (SEP) and risk for obesity in adulthood, as well as the obesity risk initiated in childhood is altered by changes in women's access to various socioeconomic resources in adulthood. Data was gathered from the 2001 follow-up interviews of participants in the Pitt County Study. The researchers obtained several measurements from the previous study, including measurements of obesity, childhood SEP, adulthood SEP, and life-course SEP. Childhood SEP was measured by asking participants to describe the main job held by their family's primary earner, which was then categorized as either skilled labor versus unskilled labor. Adulthood SEP was measured as three variables, including the participant's highest level of education, the participant's occupation, and employment status. Life-course SEP was established by combining information on childhood and adulthood SEP. Data were analyzed using multiple logistic regression and hierarchical regression models. Statistical significance was set at $p \leq 0.05$. The results of this research showed that the mean BMI of participants was 29.6, and 30% of participants were classified as

overweight while 43% were obese. More than 80% of the women grew up in low SEP households, and 81.3% were in low SEP in adulthood. Approximately 70% of participants were considered low childhood/low adulthood SEP (low/low SEP). Only 4.6% of women were classified as high childhood/high adulthood SEP (high/high SEP). The researchers reported that 46% of women from low childhood SEP background were obese compared to 27% of women who grew up in higher SEP households. Overall, women who grew up in the lowest SEP households were twice as likely to be obese compared to those who were from less impoverished backgrounds. The researchers concluded that African-American women currently have the highest prevalence of obesity among any US demographic group, and more research should be geared toward analyzing social determinants of obesity among this group.

Pereira et al. (2005) analyzed activity patterns of 2000 Hispanic and non-Hispanic white women living in the southeastern United States using data from the 4 Corner's Study of breast cancer. The researchers gathered information on diet and lifestyle of participants via a computerized questionnaire. A physical activity questionnaire was also implemented to assess activities performed at various levels of intensity. Language acculturation was also examined, and questions were asked regarding preference for speaking and reading Spanish. Finally, height and weight was measured at the time of the interview, and dietary intake was obtained for a detailed diet history questionnaire. Data were analyzed using descriptive statistics such as means and percentages, as well as chi-square, Student's t-test, and logistic regression. Statistical significant was set at $p \leq 0.05$. The results of this study suggested that 22% of Hispanic women reported speaking Spanish better than English or Spanish only, and 18.9% reported reading Spanish better than English or Spanish only. A significantly greater number of Hispanic participants had a BMI of greater than or equal to 30, and significantly more non-Hispanic white

women reported physical activity at moderate and vigorous levels of intensity tan Hispanic woman. Additionally, Hispanic women reported doing more housework, dependent caregiving, dancing, and jobs involving standing and vigorous activity than non-Hispanic white women. Both non-Hispanic white women and Hispanic women were significantly less likely to be overweight or obese if they had high levels of physical activity. Finally, those that were considered to have an intermediate level of language acculturation compared with non-Hispanic white women were approximately three times more likely to be overweight or obese, and women with the lowest levels of language acculturation had the lowest levels of physical activity. The researchers concluded that promotion for culturally accepted physical activity among Hispanic women is needed to combat the growing prevalence of obesity and chronic diseases within this ethnic group.

2.1.4 Overweight and Obesity Among College Students

Racette, Deusinger, Strube, Highstein, and Deusinger (2008) conducted a prospective, longitudinal, observational study to assess changes in body weight and BMI among a sample of 204 students from the beginning of their freshman year to the end of their senior year at a private university in St. Louis Missouri. The students were recruited during their freshman year in either 1999 or 2000.The students were administered several questionnaires, including a demographic questionnaire, an exercise questionnaire that determined whether they performed aerobic, strengthening, and stretching exercises on a regular basis, and a dietary questionnaire that assessed whether the students were meeting the guidelines established by the 5 A Day campaign. (Serdula, Cobb, & Crowell, 2005) The findings were obtained using 2-sample t-tests with a statistical significance of $p \leq 0.05$. The findings indicated that 5% of freshmen were classified as underweight, 80% were normal weight, and 15% were overweight or obese. However, by the end

of their senior year, the percentage of obese/overweight students increased to 23%. Specifically, weight, height, and BMI increased from freshman to senior year for both males and females, although these changes were highly variable among the students. Additionally, 29% of freshman participants did not exercise on a regular basis, and only 29% of freshman participants consumed five servings of fruits and vegetables daily. By their senior year, 25% of the students did not exercise regularly, and 71% of seniors ate fewer than the recommended daily servings of fruits and vegetables. Overall, the students' BMI increased significantly, although modestly, over their 4 years of college. Fewer than one-third of the students reported consuming the recommended servings of fruits and vegetables during the freshman or senior data collection periods. The researchers noted that some weight gain could have been attributed to normal growth and maturation, but an increase in adiposity could contribute to future health risks if trends continued throughout adulthood.

Huang et al. (2003) conducted a study to assess the rate of overweight and obesity, dietary behaviors, and physical activity among a sample of 736 college students attending the University of Kansas. University students ages 18 to 27 participated in a cross-sectional survey during the spring of 2001 and the spring of 2002. The survey included self-reported weight and height questions, a fruit, vegetable, and fiber screener, and three questions from the Youth Risk Behavior survey (Grunbaum et al., 2000). The first method defined overweight as a BMI between the 85th percentile to the 94^{th} percentile for age and gender, and obesity as a BMI at or above the 95th percentile. The second method defined overweight as a BMI of 25 kg/mg^2 to 29.9 kg/mg^2, and obesity as a BMI at or above 30 kg/m^2. BMI was defined using the second method only for students 20 years of age and older. and obesity rates were calculated by gender and age group, and chi-square tests were used to differentiation between the proportions of genders and

age groups, with a significance level of $p \leq 0.05$. The results indicated that there was a lower percentage of obesity and overweight students when using the BMI percentile cutoff for those ages ≤ 19 compared to the use of the BMI formula. However, both methods indicated that men were more likely to be overweight or obese compared to women. Additionally, students ages 20 years or older were more likely to be overweight and obese than students 19 years and younger. Sixty-eight percent of participants reported consuming fewer than five servings of fruits and vegetables per day, and 67.1% consumed less than 20g of fiber per day. Women consumed significantly less fiber than men, and were more likely to consume fewer than 20 g of fiber per day. Male students were more likely to engage in aerobic exercise and for more days per week than females ($p < 0.001$), and students aged 19 and younger years were likely to engage in aerobic exercise than older students ($p < 0.01$). Overall, a high percentage of students were overweight and obese and engaged in unhealthy dietary habits, such as low fruit and vegetable intakes or low levels of physical activity. The authors concluded that unhealthy behaviors such as these, in turn, could increase the students' risk of developing chronic diseases in the future.

Sira and Pawlak (2010) conducted cross-sectional survey research to investigate the rates of overweight/obesity and eating attitudes among college students. Their specific objectives were to weight status by BMI category, the rate of overweight and obesity, dieting attitudes, and any differences in dieting by gender and ethnic background. A total of 582 undergraduate students completed a questionnaire that included demographic information and self-reported weight and height. The questionnaire also measured either eating attitudes and behaviors in college students by using the abbreviated version of the Eating Attitudes Test (EAT 26) (Garner, Olmsted, Bohr, & Garfinkel, 1982) or healthy dieting questions. The EAT 26 consisted of 26 questions that assess a broad range of anorexia/bulimia nervosa symptoms. A total of 348 out of the 582

students (60%) completed the EAT 26, and 234 out of the 582 students (40%) completed the healthy dieting questions. Data was analyzed using descriptive statistics including mean, range, frequencies and percentages, as well as one-way analysis of variance (ANOVA), and chi-square. Statistical significance was set at $p < 0.05$. The results indicated that 15.1% of the students were underweight, 21.4% were overweight, and 10.8% were obese. Males had a significantly higher mean BMI than females ($p < 0.001$), and the BMI for African American students was significantly higher than the mean BMI of White students ($p < 0.001$). White females had a significantly lower mean BMI than African American females ($p < 0.001$), but there was no significant difference between the mean BMI of White and African American male students ($p < 0.506$). EAT 26 scores was from 0 to 51, and a statistically significant difference emerged between the EAT 26 scores of females and males, indicating that females reported more dieting behaviors than males ($p < 0.001$). Additionally, 12.64% of the 348 students had an EAT 26 score over 20, suggesting disordered eating behaviors. Overall, higher rates of overweight and obesity were reported among African American students compared to White students ($p < 0.001$). The analysis of the EAT 26 indicated that more than 12% of the sample had disturbed eating patterns, and 64% of female students that reported excessive dieting behaviors were within the BMI range for normal weight.

Ratanasiripong and Burkey (2011) studied the gender and racial difference of actual body size in relation to perceived body size, possible underreporting of overweight and obesity, and weight management strategies among 1,798 college students attending a large, public university in the Western part of the United States. Of the participating students, 3% were African American, 19% were Asian American, 19% were Latino/Hispanic, and 43% were White. The researchers administered that included questions concerning demographic information, actual

weight, height, and self-reported body image. Paired sample t-tests compared differences in body image and BMI, and statistical significance was $p < 0.01$. The results indicated that 18% of the female students were actually overweight and 11% were obese, but 28% of females reported being overweight, and 3% obese. Approximately 30% of the male students were actually overweight and 16% were obese, but only 26% of males self-classified as overweight and 2% as obese. Male participants underreported significantly more than females ($p < 0.001$), however, there was no significant difference of underreporting among the four ethnic groups ($p < 0.81$). Overall, a significant number of participants (number and percent not indicated by authors) indicated their lack of awareness of their true body size by underreporting their actual weight status, suggesting that specific ethnic and gender-based interventions should be implemented to increase greater awareness of body size and strengthen skills for healthy weight management.

A study conducted by Sacheck, Kuder, and Economos (2010) examined the impact of fitness and adiposity on metabolic risk factors of incoming freshman college students each year from 1998 until 2007 at Tufts University. The specific study objectives were to assess physical fitness and metabolic risk factors, determine whether fitness or body fat percentage was associated with these risk factors, and determine whether fitness alone or paired with body fat could influence metabolic risk factors in college students. Data were collected using the Tufts Longitudinal Health Study (TLHS) from 1998 to 2007, and information on anthropometric measurements, physical fitness, and blood lipid profiles was obtained from the 564 participants. Data were stratified by gender before analysis. The level of statistical significance was $p < 0.05$. The results indicated that 16.2% of the sample was classified as overweight and obese, but male students had higher physical fitness compared to the U.S. norms. Furthermore, one-fourth of the students had low fasting blood HDL-c concentrations, one-third had elevated fasting blood LDL-

c concentrations, and 11% had elevated fasting blood triglyceride concentrations. ("Cholesterol Levels: What you Need to Know," 2012) Men had lower total cholesterol and HDL levels compared with women, and having a higher body fat percentage was positively associated with higher cholesterol, triglycerides, and LDL-c in both men and women ($p < 0.05$). Greater fitness was associated with higher HDL and lower triglyceride levels in women and lower glucose levels in men. The students were also grouped into four categories based on fitness and percent body fat. The findings revealed that 31% were fit/not fat, 36.7% were fit/fat, 9.2% were unfit/not fat, and 22.8% were unfit/fat. The authors concluded that metabolic risk factors were prevalent in this student sample, and that being overweight or less physically fit could predispose these students to greater metabolic risks.

Brunt and Rhee (2008) conducted a study to determine the differences in diet and health behaviors possibly linked to living arrangements of 585 students attending a mid-western university in the United States. The researchers assessed diet, alcohol consumption, smoking, restricted eating, and overweight/obesity as determined by calculating BMI from self-reported height and weight data, and students who did not provide these data were excluded. The students were administered a Diet Variety Questionnaire (DVQ) that was developed from the 24-hour dietary recalls obtained from a pilot study of 75 students. Descriptive statistics such as mean, standard deviations, percentages, and frequencies were used to analyze the data, and the level of statistical significance was $p < 0.05$. The findings indicated that the median BMI for the 585 students was 23.0 kg/m^2, and that 25% of students were overweight, 9% were obese, and 4% were underweight. The distribution of BMI categories was significantly different between gender and living arrangements. Males were more likely to be overweight or obese when compared to females, but these findings may have been influenced by the fact that many of the male

participants were exercise science majors and were more muscular in comparison to students in other majors. Those who lived off-campus were more likely to report smoking and drinking alcohol. Additionally, there was an inverse association between BMI and smoking for men ($p < 0.0353$). Those that lived on-campus or with parents consumed ice cream/milk desserts, leafy green vegetables, white bread, other grains, and sweet baked products more often than those who lived-off campus. However, those living off-campus consumed more alcohol and fewer fruits than on-campus residents. Those who lived on-campus consumed a wider variety of fruits, vegetables, fruits/vegetables combined, dairy products, and grains. Overall, the researchers concluded that the students who lived off-campus had increased health risks, such as being overweight or obese, increased cigarette smoking and alcohol consumption, and decreased consumption of fruits and vegetables overall.

Edman, Yates, Aruguete, and DeBord (2005) examined the relationship between negative emotions, body dissatisfaction, exercise, and disordered eating attitudes and behaviors among 190 obese college students. The researcher administered a that consisted of several scales, including the Anger Discomfort Scale (ANGDIS) (Sharkin & Gelso, 1991),the Self Loathing Sub-Scale (SLSS) (Yates, Edman, Crago, Crowell, & Zimmerman, 1999), figure drawings of nine body images including a range from slender to very large figures, the Eating Disorder Inventory-2 (EDI-2) (Yates et al., 1999), measures of exercise behaviors and attitudes. The results indicated that females reported higher levels of Drive for Thinness (DT), Interceptive Awareness (IA), and dieting than males. Additionally, 98% of females preferred a smaller figure, and 2% were satisfied with their present body shape; 81% of males preferred a smaller figure, 14% were satisfied with their body, and 5% preferred a larger body. Male scores on all exercise variables were higher than females, such as investment, intensity, regularity, and hours of

exercise. There was an association between body dissatisfaction ($p < 0.01$), anger discomfort ($p < 0.01$), self-dissatisfaction ($p < 0.01$), and Drive for Thinness for females ($p < 0.01$). In conclusion, females reported higher levels of disordered eating than males, as indicated by the scores for Drive for Thinness and Interceptive Awareness. Women also reported higher dissatisfaction with their body, self-dissatisfaction, and dieting than men, despite no BMI difference between genders. Furthermore, body dissatisfaction and self-dissatisfaction were associated with disordered eating for both genders. The authors concluded that psychological variables such as self-loathing and negative emotions may be stronger predisposing risk factors for body weight and eating disorders than dieting.

2.2 Health Implications of Overweight/Obesity

Patterson, Frank, Kristal, and White (2004) conducted a study that examined the health conditions associated with obesity in older adults. This study was a cross-sectional analysis of body mass index (BMI) and the health conditions of 73,000 older adults ages 50 to 76 years living in 13 counties of western Washington State. The researchers used self-reported height and weight, and combined the upper categories of BMI (obese II/III) for analysis. Those that were considered underweight or cases with missing data were excluded. The researchers also obtained self-reported health conditions from participants and grouped them into four categories: serious diseases such as stroke or cancer, asymptomatic health conditions associated with CVD, physician-diagnosed medical conditions, and health complaints such as chronic headaches and fatigue. Data were analyzed using an odds ratio from separate logistic regression models to examine associations between the four BMI categories and the categories of health conditions. The association of BMI and health conditions was assessed by a test for trend using the logistic regression analogue to the Mantel extension test. The results indicated that 59.7% of women and

72.2% of men were overweight or obese. There was a statistically significant ($p < 0.05$) positive association between 37 of the 41 health conditions and higher BMI among women. The strongest associations for women (odds ratio>3) for obese category II/II were for diabetes, knee replacement, history of congestive heart failure, hypertension, gallbladder removal, and chronic fatigue/lack of energy. An inverse association emerged between BMI and osteoporotic fractures. For men, 29 of the 41 health conditions were associated with increased levels of obesity ($p < 0.05$). The strongest associations between BMI and health conditions for men ($OR > 3$) include diabetes, knee replacement, hypertension, fatigue/lack of energy, and insomnia. There was a modest, significant inverse association with enlarged prostate. Overall, 90% of the conditions reported were associated with increased BMI in women and 71% in men. The researchers concluded that the percent difference between men and women represented a real gender difference and that there was a broad range of diseases and health complaints associated with obesity.

Jia and Lubetkin (2005) investigated the relationship between obesity and health-related quality-of-life by examining data from the 2000 Medical Expenditure Panel Survey. The Short Form 12 (SF-12) (Ware & Sherbourne, 1992), a 12-question version of a health profile that assess the health status of patients or a population to assess the impact of conditions or treatments, and the EuroQol (EQ-5D) (EuroQol, 1990), a health index, were used in addition to life expectancy to create summary of health in a population. Data were derived from 13,646 subjects, and BMI was calculated from self-reported heights and weights. The SF-12 consisted of 12 items that measured physical functioning limitations due to physical health, bodily pain, general health, vitality, social function, role limitations due to emotional health, and mental health. The EQ-5D used a descriptive system that allowed respondents to classify their health

according to five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Data were analyzed using descriptive statistics as well as multivariate linear regressions, and statistical significance was $p < 0.05$. The results indicated that 2.1% of the participants were underweight, 39.7% were of normal weight, 35.1% were overweight, and 15% were obese. Those who reported higher incomes and engaging in moderate or vigorous physical activity three or more times a week were more likely to have normal weight. Those with diabetes were least likely to have a normal weight, and were most likely to have class II obesity. Both measures from the SF-12 and EQ-5D decreased with increasing level of obesity, and those participants within the class II obesity category had the greatest reduction in score for the SF-12 and EQ-5D tests. Chronic conditions were also associated with lower SF-12 and Eq-5D scores. HRQL scores continued to decline as BMI increased, and even in the absence of chronic conditions, HRQL scores decreased with obesity. The authors concluded that while severely obese participants had the lowest scores, those who were overweight or mildly obese may present a bigger problem, as approximately 50% of the US adult population falls within this weight category.

2.3 Overview of the Health Belief Model

The Health Belief Model (HBM) was original designed by Hochbaum, Rosenstock, and Kegels (1952). The purpose of the HBM was to explain and predict preventative health behaviors. Specifically, the HBM attempts to predict health-related behavior in regards to certain belief patterns. The HBM can be applied to many types of studies and health behaviors. The HBM is comprised of several key descriptors or variables, including perceived susceptibility, perceived severity, perceived benefits of taking action, barriers to taking action, cues to action, and self-efficacy. Perceived susceptibility can be defined as an individual's perception of the

likelihood of experience a condition that would negatively affect his/her health. Perceived severity refers to the beliefs a person has concerning the effects a disease or condition would have on his/her health or well-being. Perceived benefits of taking action means that taking action toward preventing a disease or dealing with an illness will improve a person's quality of life. Barriers to action are variables that prevent a person from taking desired action. Finally, cues to action may influence a person's need to take action based on perceived susceptibility and severity of experiencing a condition. These cues may be internal or external.

O'Connell, Price, Roberts, Jurs, and McKinley (1985) conducted a study to examine the dieting and exercising behavior of obese and non-obese adolescents aged 16 years and younger. The researchers distributed a questionnaire to 69 obese adolescents and 100 non-obese adolescents that consisted of questions based on the variables of the HBM. These variables included knowledge on the etiology and demographic variables of obesity as well as the proper means of losing weight through dieting and exercising, perceived severity of obesity, perceived susceptibility to the causes of obesity, cues to losing weight by dieting and exercising, benefits of losing weight by dieting and exercising, barriers to losing weight by dieting and exercising, and social support for dieting and exercising. The questions were formatted using the Likert scale. The researchers used discriminant stepwise regression to analyze all of their data, and a significant value was determined at $p \leq 0.05$. The results of this study showed that 41% of obese adolescents reported that they were presently dieting. Additionally, the benefits of dieting and social approval for exercise variables were significant in predicting dieting behavior of obese adolescents. The obese adolescents generally "agreed" that dieting to lose weight would be beneficial toward their physical and mental health. Cues to exercising and social approval for diet variables were significant in predicting exercising behavior of obese adolescents, and obese

adolescents believed that cues to of poor muscle tone, pressure from peers, and poor health would motivate them to exercise. External cues of peer pressure and internal cues of poor health were also significant predictors of exercising behaviors for obese adolescents. Overall, the researchers concluded that the use of the HBM toward predicting dieting and exercising behavior of obese and non-obese adolescents seemed limited, though age may have played a significant role in explain health behaviors while utilizing the HBM. Nevertheless, the researchers suggested that weight control programs for obese adolescents should attempt to emphasize the benefits of maintaining a healthy weight, as well as encourage participation in exercise by emphasizing cues to exercising.

James, Poebee, Oxidine, Brown, and Joshi (2012) conducted seven focus groups with 50 overweight and obese participants based on the HBM to design culturally appropriate weight-management programs for African-American women. The moderator was guided by 13 questions that covered major topics such as perception of health weight, overweight and obesity, perceived consequences of obesity, barriers and motivators to weight loss, information needed to lose weight, and sources for additional information on dieting. All data was comprised into reoccurring themes and patterns, and the transcripts were coded by members of the research team. The results of this study were divided by the HBM variables. For susceptibility, the women felt that they were naturally more susceptible to being obese than white women because of genetics. For severity, the viewed obesity as life threatening and debilitating, as well as a restrictor for enjoying life and limiting wardrobe options. Many of the women felt that the benefits to losing weight included having more energy and self-esteem, improving personal appearance, increase enjoyment of life, and decreasing the risk of developing chronic diseases and illnesses such as high blood pressure and diabetes. There were several barriers that prevented

women from losing weight, including lack of motivation, lack of reliable information, no time to exercise, and friends/relatives were not always supportive of a healthy lifestyle. In fact, many of the women believed that their peers were enablers for poor diet and exercise. The focus group also identified several cues to action to losing weight, including a diagnosis of a health problem, physical appearance, and tightness of clothing. Finally, women with high levels of self-efficacy were more likely to take the necessary actions to managing their weight, and most women expressed with frustration with the history of dieting, lack of basic information, and lack of support for losing weight. Overall, the researchers suggested that decision to lose weight was heavily based on the perception of one's weight, and most women believed culture and genetics make them susceptible to obesity. Lack of time was considered a major barrier for the women in the focus group, but they listed several benefits to losing weight with an emphasis of avoiding a development of diabetes and hypertension. The researchers concluded that the HBM worked well with the focus groups and are confident that the results of this study will help programs and messages focus more on lifestyle management, emphasizing the health benefits of losing weight, and emphasizing the relationship between weight and chronic diseases.

Chapter Three: Protocol

3.1 Participants and Recruitment

A random sample of 6,000 students attending Appalachian State University (ASU) received email recruitment letters with a link to a weight belief survey during the fall, 2015 and spring, 2016 semesters. Students were contacted through email addresses provided by the University's Office of Institutional Research, Assessment, and Planning. The sample included undergraduate and graduate students, males and females, students living on and off campus, and students of diverse race/ethnic backgrounds. The 6,000 electronic recruitment emails were sent as two separate batches, with the first 3,000 sent on November 16, 2015, followed by a reminder email five days later as recommended by Dillman, Smyth, and Melani (2011). The survey was closed on November 25, 2015, and was not reopened until February 1, 2016, when the same batch of 3,000 email recruitment letters was resent. Given that the focus of this study was on the students' usual access to an adequate diet, the decision to discontinue data collection around the Thanksgiving and Christmas holidays was based on the concern that the students' access to food and to resources for accessing food may have been altered over this period, possibly resulting in the collection of atypical weight belief data. The survey closed for the first batch of 3,000 students on February 7, 2016, and the second batch of 3,000 email recruitment letters was sent on February 8, 2016, followed by an email reminder on February 13, 2016. The students who agreed to participate clicked a link that took them to the Informed Consent letter that appeared prior to the first questionnaire item. This letter briefly described the objectives of the study, indicated that the study was being undertaken in partial fulfillment of a graduate student's requirements for an M.S. degree in nutrition, outlined the elements of informed consent, and

indicated that no compensation was being offered for participation. The recruitment letter can be found in Appendix A. Approval to conduct this study was obtained from the Office of Research Protections at ASU.

3.2 Survey Questionnaire

Data were collected using an anonymous, three-part online questionnaire uploaded to Qualtrics Survey Software (2016). This method of questionnaire administration was selected because of the widespread use of computers by college students, a greater number of completed questionnaires can be collected in a shorter time compared to on-site recruitment and administration, the data are continuously saved online, and data can be easily exported to a statistical software for analysis, as noted by Fan and Yan (2010). Part one of the questionnaire consisted of five items that assessed perceptions, attitudes, and behaviors concerning personal weight. The students described their perceived weight status by selecting either "underweight," "neither underweight nor overweight," "overweight," or "obese." Attitude toward current weight was determined using the response options "very satisfied," "satisfied," "dissatisfied," or "very dissatisfied." Next, the students selected either "yes" or "no" to indicate whether they had attempted weight loss within the previous 12 months. This section concluded by asking the students to type in their estimated height and weight (used to calculate body mass index [BMI]). Part two of the questionnaire consisted of five scales and associated subscales corresponding with the constructs from the HBM (Jeihooni, Hidarnia, Kaveh, Hajizadeh, & Askari, 2015; McArthur, Holbert, & Forsythe, 2006) The perceived severity of the possible outcomes associated with overweight/obesity was assessed using 17 items assigned to three subscales with the following Cronbach alpha reliability coefficients: physical health/fitness subscale (8 items, $r = 0.89$), social/professional subscale (5 items, $r = 0.87$), and emotional/mental health subscale

(4 items, r = 0.89). Seven items assessed perceived susceptibility of becoming overweight/obese, assigned to two subscales with the following reliability coefficients: environmental subscale (2 items, r = 0.55) and lifestyle subscale (5 items, r = 0.89). Fourteen items assessed perceived barriers to adopting healthy eating and exercise/physical activity habits for reducing the risk of becoming overweight/obese, assigned to three subscales with the following reliability coefficients: emotional/mental health subscale (5 items, r = 0.80), awareness subscale (5 items, r = 0.90), and practical concerns subscale (4 items, r = 0.80). Two subscales were created from a 14-item cues to action scale for adopting healthy eating and exercise/physical activity habits (based on whether the cue originated internally from the students' personal beliefs or externally from outside influences), with the following reliability coefficients: internal cues subscale (6 items, r = 0.81) and external cues subscale (8 items, r = 0.86). Three subscales were created from a 15-item perceived benefits scale for adopting healthy eating and exercise/physical activity habits for reducing the risk of becoming overweight/obese, with the following reliability coefficients: physical health/fitness subscale (7 items, r = 0.87), emotional/mental health subscale (5 items, r = 0.85), and social/professional subscale (3 items, r = 0.65). Each scaled item was formatted on a 5-point scale, and in each case scores of "1" and "2" represented lower perceptions of the respective construct, "3" designated the neutral point, and "4" and "5" reflected stronger perceptions of the respective construct. The items associated with each construct were compiled from studies using the HBM to measure college students' perceptions associated with health conditions.

The questionnaire concluded with three items that measured the students’ knowledge of weight-related topics, five demographic items, and one item assessing the students' previous exposure to nutrition education. The knowledge questions used a multiple-choice format with

four answer choices. These questions focused on factors contributing to the development of overweight/obesity, the health risk associated with the regional distribution of body fat, and possible health consequences of overweight/obesity. The five demographic questions elicited information about gender, age, year at the University, race/ethnic affiliation, and academic major. The final item was a "yes/no" question asking the students if they had taken a university level nutrition course. The questionnaire can be found in Appendix B.

3.3 Pilot Test

The questionnaire was pilot tested twice. The initial pilot test was administered using a paper-pencil format with 30 randomly selected students. Recruitment took place at high-traffic locations on-campus on different weekdays and at different times of day to minimize a selection bias. Recruitment and questionnaire administration for this first pilot test were accomplished by the graduate student principle investigator with the assistance of an undergraduate student. Revisions were made to the questionnaire based on student input, including clarification of wording and addition and deletion of items. The revised questionnaire was loaded onto Qualtrics Survey Software for the second pilot test. The participants in this follow-up pilot test were 15 nutrition undergraduate and graduate students and two nutrition professors. This online pilot test verified that the questions were clearly displayed and that the buttons associated with the response options functioned properly.

3.4 Statistical Analyses

Data were analyzed using SPSS Statistical Software Version 22.0 (2013). Frequency distributions, percentages, means (SD), and ranges were obtained for demographic data, the HBM variables, the three-item overweight/obesity knowledge test, and BMI. One-way ANOVA was used to analyze statistical significance between demographic data and the HBM variables

and subscales. Cronbach alpha reliability coefficients were obtained for the subscales created from the HBM variables.

Correlational analyses were also performed to assess relationships between gender and BMI, demographics and weight satisfaction, and demographics and responses to the HBM scales. T-tests compared mean scores on the HBM subscales based on demographics and BMI. The three knowledge questions were scored by assigning one point to each correct answer and zero points to each incorrect answer, and mean (SD) scores were calculated. Statistical significance was $p \leq 0.05$ for hypothesis testing.

Chapter Four: Results

4.1 Demographic Characteristics

Electronic recruitment letters were emailed to 6,000 students, of whom 865 (14.4%) partially completed the questionnaire and 560 (9.3%) completed the entire questionnaire. Despite the differences in the numbers of students who responded to the various questionnaire items, the 305 partially completed questionnaires were not discarded since each variable from the HBM can be considered independently of the others, and each variable provides useful information concerning the students' beliefs related to body weight that can be used to design educational interventions targeted at this population.

Table 1 shows the frequency counts and percentages for the demographic characteristics of the student sample, and the number of students who responded to each item. Approximately three-fourths of the participants were female, over three-fourths were white, not of Hispanic origin, and almost half were freshmen/sophomores, about 40% were juniors/seniors, and less than 10%were graduate students. Approximately one-third of the students were majoring in a physical/mental health-related discipline, and almost 40% had taken a college/university level nutrition course. Additionally, the students' mean age was 20.6 years (± 3.7, range 18 to 63), and, based on self-reported weight and height data, their mean BMI was 23.9 kg/m^2 (± 4.5, range 15.2 to 44.5 kg/m^2).

Table 1

Demographic Characteristics of the Student Sample

Characteristic	n	%	Total # of Responses
Gender			
Female	399	71.6	
Male	158	28.4	
			557
Race/Ethnic Background			
White, Non-Hispanic	484	89.6	
Hispanic	26	4.7	
Asian	15	2.7	
Black, Non-Hispanic	15	2.7	
Native American	9	1.6	
Other	7	1.3	
Pacific Islander	3	0.5	
Black, Hispanic Origin	0	0	
			559
Year in School			
1st Year	167	29.8	
Sophomore	100	17.8	
Junior	108	19.3	
Senior	138	24.6	
Graduate	45	8.0	
Other	3	0.5	
			561
Academic Major			
Physical/mental health related	187	33.4	
Not physical/mental health related	360	64.3	
No declared major	13	2.3	
			560
Taken College/University Nutrition Course			
Yes	217	38.8	
No	342	61.2	
			559
Weight Category			
Underweight (<18.5 BMI)	25	4.5	
Normalweight (18.5-24.9 BMI)	349	63.2	
Overweight (25.0-29.9 BMI)	119	21.6	
Obese (≥ 30.0 BMI)	59	9.9	
			552

4.2 Weight Perceptions and Weight Loss Attempts

Data concerning perceived weight status were provided by 557 students (158 males and 399 females), of whom 34 (6.1%) perceived themselves as underweight (BMI < 18.5 kg/m^2), 368 (66.1%) as neither underweight nor overweight (BMI = 18.5 - 24.9 kg/m^2), 136 (24.4%) as overweight (BMI = 25 - 29.9 kg/m^2), and 19 (3.4%) as obese (BMI ≥ 30 kg/m^2).

A statistically significant difference ($p = 0.001$) was found between the percent of males and females based on their perceived body weight, with a greater percent of males self-classifying in the underweight/normal weight categories and a greater percent of females self-classifying in the higher weight categories. Accordingly, 11.4% of males vs. 4.0% of females perceived themselves as underweight, 68.4% of males vs. 65.2% of females selected the neither underweight nor overweight category, 17.7% of males vs. 27.1% of females perceived themselves as overweight, and 2.5% of males vs. 3.8% of females perceived their weight status as obese. The calculated BMIs for the 557 students (158 males and 399 females) who provided height and weight data also revealed Gender-based differences, such that greater percentages of females than males had BMIs in all four weight categories, however there was no statistical difference between BMI and gender ($p = 0.686$). Hence, 1.4% of males vs. 3.1% of females were underweight, 17.6% of males vs. 45.7% of females were normal weight, 7.2% of males vs. 14.3% of females were overweight, and 2.2% of males vs. 8.5% of females were obese per their BMI.

Weight satisfaction data were provided by 817 students, of whom 414 (50.7%) were very satisfied/satisfied with their weight, while 403 (49.3%) were dissatisfied/very dissatisfied. There was a statistically significant difference ($p < 0.001$) between the percentages of males and females based on body weight satisfaction, with females reporting greater dissatisfaction.

Accordingly, 60.8% of males were very satisfied/satisfied vs. 47.1% of females, and 39.2% of males were dissatisfied/very dissatisfied vs. 52.9% of females. Additionally, 817 students indicated whether they had attempted weight loss over the past 12 months, of whom 530 students (64.9%) had and 287 students (35.1%) had not attempted weight loss over that period. A statistically significant gender-based difference ($p < 0.001$) emerged, such that 48.1% of males vs. 74.2% of females had attempted to lose weight over the previous year.

4.3 Perceived Severity of Consequences Associated with Overweight/Obesity

The students' mean score on the 17-item perceived severity scale was 3.8 points (± 0.8, range 1 to 5) out of a possible five points. Significant differences emerged between the mean scores based on previous exposure to nutrition education and academic major, such that students who had taken a college/university level nutrition course scored higher than students who had not taken such a course (3.9 ± 0.7 vs. 3.7 ± 0.7, $p = 0.003$), and students majoring in physical/mental health-related disciplines scored higher than students in other majors (3.9 ± 0.7 vs. 3.7 ± 0.7, $p = 0.038$). No significant differences were found between the mean scores on the perceived severity scale based on gender ($p = 0.840$), year in school ($p = 0.846$), or on whether students had or had not taken a college/university level nutrition course ($p = 0.846$).

Table 2 shows the items from the three perceived severity subscales, the mean subscale scores, and the number of students who completed each subscale. The items from the emotional/mental health subscale received the greatest number of 4 and 5 scores (on a five-point scale), with a mean score of 4.2, indicating that these outcomes were perceived as severe consequences of overweight/obesity. Items from the social/professional subscale received the greatest number of 1 and 2 scores, with a mean score of 3.1, indicating that these outcomes were perceived as less severe.

Significant differences were found between the mean scores on the physical health/fitness subscale for students who had or had not taken a college/university level nutrition course (4.0 ± 0.7 vs. 3.9 ± 0.8, $p = 0.001$) and for students in physical or mental health-related majors and students in other majors **(**4.1 ± 0.7 vs. 3.9 ± 0.8, $p = 0.033$). However, no significant differences emerged between the mean scores on this perceived severity subscale based on gender ($p = 0.693$) or year in school ($p = 0.283$). Significant differences were also found for the mean scores from the social/professional subscale between students who had taken a college/university level nutrition course and students who had not taken such a course (3.3 ± 1.0 vs. 3.1 ± 0.9, $p = 0.019$) and between students majoring in physical or mental health-related disciplines and students majoring in other disciplines **(**3.3 ± 0.9 vs. 3.1 ± 1.0, $p = 0.048$). No significant differences emerged on this perceived severity subscale based on gender ($p = 0.160$) or year in school ($p = 0.165$). Nor were significant differences found between the mean scores on the emotional/mental health subscale based on gender ($p = 0.283$), year in school ($p = 0.468$), previous exposure to nutrition education ($p = 0.072$), or on academic major ($p = 0.362$).

A Pearson product-moment correlation coefficient ($r = - 0.18$) was calculated to describe the association between the students' BMIs and their mean scores on the overall perceived severity scale. There was a statistically significant correlation ($p < 0.001$) between the students' BMIs and their mean scores on the overall perceived severity scale, thus as students' BMI increased, the overall perceived severity scale was rated lower.

Table 2

Mean Scores on Perceived Severity Subscales

Subscale	Mean Score SD	Number of Responses
Physical Health/Fitness Have an unfavorable effect on my general health in years to come Make it harder to do the exercise or sports activities I enjoy Make it harder to get enough restful sleep Cause pain in my knees Increase my risk for developing diabetes Increase my risk for developing heart disease Increase my risk for developing high blood pressure Increase my risk for developing some type of cancer	3.9 0.8	733
Social/Professional Make it harder to make friends Make it harder to get the internship or job I want because of weight discrimination Take some of the fun out of socializing with friends Make it harder to get dates Make it harder to get into a graduate or professional program because of weight discrimination	3.1 1.0	739
Emotional/Mental Health Make me feel depressed, anxious, or stressed Cause other people to find me less physically attractive Make me unhappy Lower my self-esteem	4.2 0.9	743

4.4 Perceived Susceptibility to Becoming Overweight/Obese

The students' mean score on the seven-item perceived susceptibility scale was 3.5 points (± 0.9, range 1 to 5) out of a possible five points. Three significant differences emerged between the mean scores on this scale based on gender, year in school, and previous exposure to nutrition education. Accordingly, females scored higher than males (3.7 ± 0.9 vs. 3.5 ± 0.9, $p = 0.024$), third/fourth year students scored higher than first/second year students (3.7 ± 0.8 vs. 3.5 ± 0.9, $p < 0.001$), and students who had taken a college/University level nutrition course scored higher than those who had not taken such a course (3.7 ± 0.9 vs. 3.5 ± 0.9, $p = 0.017$). No significant difference was found between the mean scores on this scale based on academic major ($p = 0.484$).

Table 3 shows the items from the two perceived susceptibility subscales, the mean subscale scores, and the number of students who completed each subscale. The items from the lifestyle subscale received the greatest number of 4 and 5 scores (on a five-point scale), with a mean of 3.7, indicating that these behaviors were associated with a greater perceived risk for becoming overweight/obese. Items from the environmental subscale received the greatest number of 1 and 2 scores, with a mean of 3.1, indicating that they were associated with a lower perceived risk.

Four significant differences were found between the mean scores on the environmental subscale as follows: females scored higher than males (3.3 ± 1.0 vs. 2.9 ± 0.9, $p < 0.001$), third/fourth year students scored higher than first/second year students (3.2 ± 0.9 vs. 3.1 ± 1.0, $p = 0.039$), students who had taken a college/university level nutrition course scored higher than those who had not taken such a course (3.3 ± 1.0 vs. 3.1 ± 1.0, $p = 0.004$), and students majoring

in physical/mental health-related disciplines scored higher than students in other majors (3.4 ± 1.0 vs. 3.1 ± 0.9, $p = 0.002$). A significant difference ($p < 0.001$) based on year in school was also found for the lifestyle subscale, such that third/fourth year students scored higher (3.9 ± 0.9) than first/second year students (3.6 ± 1.1). No significant differences were found between the mean scores on the lifestyle subscale based on gender ($p = 0.178$), previous exposure to nutrition education ($p = 0.064$), or academic major ($p = 0.985$).

A Pearson product-moment correlation coefficient ($r = 0.061$) was calculated to describe the association between the students' BMIs and their mean scores on the overall perceived susceptibility scale. There was no statistically significant correlation ($p = 0.096$) between the students' BMIs and their mean scores on the overall perceived susceptibility scale.

Table 3

Mean Scores on Perceived Susceptibility Subscales

Subscale	Mean Score SD	Number of Responses
Environmental One or both of my parents is overweight or obese My race/ethnic group has a high occurrence of overweight and obesity	3.1 1.0	707
Lifestyle I get less than 30 minutes of moderate-intensity exercise/physical activity on most days I consume sugary beverages, foods, or snacks daily or on most days I eat fried foods or snacks daily or on most days I eat at fast food restaurants three or more times/week I don’t pay attention to the amount I eat or drink	3.7 1.0	706

4.5 Perceived Barriers to Adopting Healthy Eating and Exercise/Physical Activity Habits

The students' mean score on the 14-item perceived barriers scale was 2.6 points (± 0.9, range 1 to 5 out of a possible five points. A significant gender-based difference ($p = 0.002$) was found between the mean scores on this scale, with females scoring higher (2.7 ± 0.9) than males (2.5 ± 0.9). No significant differences were found between mean scores on the perceived barriers scale based on year in school ($p = 0.063$), previous exposure to nutrition education ($p = 0.921$), or academic major ($p = 0.567$).

Table 4 shows the barriers from the three subscales, the mean subscale scores, and the number of students who completed each subscale. The barriers from the practical concerns subscale received the greatest number of 4 and 5 scores (on a five-point scale), with a mean of 3.0, indicating that these were perceived as stronger obstacles for adopting healthy eating and exercise/physical activity habits. The barriers from the awareness subscale received the greatest number of 1 and 2 scores, with a mean of 2.3, indicating that these were perceived as weaker obstacles.

A significant gender-based difference ($p = 0.039$) was found between the mean scores on the emotional/mental health subscale, such that females scored higher (2.8 ± 1.0) than males (2.5 ± 0.9). No significant differences between mean scores were found for this subscale based on year in school ($p = 0.063$), previous exposure to nutrition education ($p = 0.556$), or academic major ($p = 0.476$). A significant difference ($p = 0.004$) emerged between the mean scores on the awareness subscale based on gender, such that females scored higher (2.4 ± 1.1) than males (2.1 ± 1.0). No significant differences were found between the mean scores on this subscale based on year in school ($p = 0.189$), previous exposure to nutrition education ($p = 0.856$), or

academic major ($p = 0.212$). Two significant differences were found between the mean scores on the practical concerns subscale based on gender and year in school. Accordingly, females scored higher than males (3.1 ± 1.0 vs. 2.8 ± 1.0, $p < 0.001$), and third/fourth year students scored higher than first/second year students (3.1 ± 1.0 vs. 2.9 ± 1.0, $p = 0.029$). No significant differences were found between the mean scores on the practical concerns subscale based on previous exposure to nutrition education ($p = 0.902$) or academic major ($p = 0.356$).

A Pearson product-moment correlation coefficient ($r = 0.153$) was calculated to describe the association between the students' BMIs and their mean scores on the overall perceived barriers scale. There was a statistically significant correlation ($p < 0.001$) between the students' BMIs and their mean scores on the overall perceived barriers scale, thus as students' BMI increased, the mean scores on the overall perceived barriers scale increased.

Table 4

Mean Scores on Perceived Barriers Subscales

Subscale	Mean Score SD	Number of Responses
Emotional/Mental Health I am not motivated to adopt healthy eating and exercise/physical activity habits I enjoy eating fried foods and snacks more than baked, steamed, or grilled versions I enjoy consuming sugary beverages, foods, and snacks more than lower-calorie versions I often turn to food when I want to feel comforted I often feel depressed, anxious, or stressed, and it makes it hard to adopt healthy eating and exercise/physical activity habits	2.7 1.0	646
Awareness I don't know where to find accurate information about how to achieve and maintain a healthy weight I don't know how to plan regular exercise/physical activity into my daily schedule I don't know where to shop for healthy beverages, foods, or snacks I don't know how to prepare lower-calorie beverages, foods, or snacks I don't know how to choose healthy beverages, foods, or snacks	2.3 1.1	644
Practical Concerns Lower-calorie beverages, foods, and snacks are too expensive Grocery shopping for healthy foods would take up too much of my time Doing exercise/physical activity on most days would take up too much of my time My job or studying means more to me than adopting healthy eating and exercise/physical activity habits	3.0 1.0	644

4.6 Internal and External Cues to Adopting Healthy Eating and Exercise/Physical Activity Habits

The students' mean score on the 14-item cues to action scale was 3.6 points (± 0.7, range 1 to 5) out of a possible five points. Table 5 shows the cues assigned to the internal and external cues subscales, the mean subscale scores, and the number of students who completed each subscale. Items comprising the internal cues subscale received the greatest number of 4 and 5 scores (on a five-point scale), with a mean of 4.0, indicating that these cues were perceived as stronger motivators for adopting healthy eating and exercise/physical activity habits. The cues from the external cues subscale received the greatest number of 1 and 2 scores, with a mean of 3.2, indicating that these were perceived as weaker motivators.

Two significant differences were found between the mean scores on the internal cues subscale based on previous exposure to nutrition education and on academic major. Students who had taken a college/University level nutrition course scored higher than those who had not taken such a course (4.2 ± 0.6 vs. 4.0 ± 0.7, $p = 0.001$), and students majoring in physical or mental health-related disciplines scored higher than students in other majors (4.2 ± 0.6 vs. 4.0 ± 0.7, $p = 0.001$). No significant differences were found between the mean scores on the internal cues subscale based on gender ($p = 0.080$) or year in school ($p = 0.063$).

Four significant differences emerged between the mean scores on the external cues subscale. Accordingly, Females scored higher than males (3.3 ± 0.9 vs. 3.0 ± 0.8, $p = 0.005$), first/second year students scored higher than third/fourth year students (3.1 ± 0.8 vs. 3.3 ± 0.9, $p = 0.038$), students who had taken a college/University level nutrition course scored higher than those who had not taken such a course (3.3 ± 0.8 vs. 3.1 ± 0.8, $p = 0.018$), and students majoring

in physical or mental health-related disciplines scored higher than students in other majors (3.4 ± 0.8 vs. 3.1 ± 0.8, $p = 0.003$).

A Pearson product-moment correlation coefficient ($r = - 0.133$) was calculated to describe the association between the students' BMIs and their mean scores on the internal cues subscale. There was a statistically significant correlation ($p = 0.001$) between the students' BMIs and their mean scores on the internal cues subscale, thus as students' BMI increased, the mean score for the internal cues subscale decreased. A Pearson product-moment correlation coefficient ($r = - 0.217$) was also calculated to describe the association between the students' BMIs and their mean scores on the external cues subscale. There was a statistically significant correlation ($p < 0.001$) between the students' BMIs and their mean scores on the external cues subscale, thus as students' BMI increased, the mean score for the external cues subscale decreased.

Table 5

Mean Scores on Internal and External Cues Subscales

Subscale	Mean Score SD	Number of Responses
Internal Cues	4.0 0.7	599
I looked in the mirror and I was dissatisfied with my body		
My clothes fit uncomfortably tight		
I developed a health problem that could be improved by achieving and maintaining a healthy weight		
I believed that others were judging me unfairly based on my weight		
Being at a healthy weight would help me achieve my personal or professional goals		
Achieving and maintaining a healthy weight would improve my depression, anxiety, or stress		
Emotional/Mental Health	3.2 0.9	600
A physician, nurse, or dietitian advised me to achieve and maintain a healthy weight		
A loved one developed a serious health problem from being overweight or obese		
A family member or close friend advised me to achieve and maintain a healthy weight		
I was presented with information about the health risks of being overweight or obese in a college course		
My partner or significant other advised me to achieve and maintain a healthy weight		
I read on a social media website (e.g., Facebook, Twitter, Pinterest, Instagram, etc.) about the health risks of being overweight or obese		
I was presented with information about the health risks of being overweight or obese in a radio, television, or podcast program		
I saw an advertisement for a product or service that claimed it would help me to achieve and maintain a healthy weight		

4.7 Perceived Benefits to Adopting Healthy Eating and Exercise/Physical Activity Habits

A Pearson product-moment correlation coefficient (r = 0.153) was calculated to describe the association between the students' BMIs and their mean scores on the overall perceived barriers scale There was a statistically significant correlation ($p < 0.001$) between the students' BMIs and their mean scores on the overall perceived barriers scale, thus as students' BMI increased, the overall perceived severity scale was rated higher.

The students' mean score on the 15-item perceived benefits scale was 4.2 points (± 0.7, range 1 to 5) out of a possible five points. Three significant differences emerged between the mean scores on this scale based on gender, previous exposure to nutrition education, and academic major. Accordingly, females scored higher than males (4.2 ± 0.7 vs. 4.1 ± 0.7, $p = 0.041$), students who had taken a college/university level nutrition course scored higher than those who had not taken such a course (4.2 ± 0.6 vs. 4.1 ± 0.7, $p = 0.024$), and students majoring in physical or mental health-related disciplines scored higher than students in other majors (4.3 ± 0.6 vs. 4.1 ± 0.7, $p < 0.001$). No significant difference was found between the mean scores on the perceived benefits scale based on year in school ($p = 0.278$).

Table 6 shows the items from the three perceived benefits subscales, the mean subscale scores, and the number of students who completed each subscale. The benefits from the emotional/mental health subscale received the greatest number of 4 and 5 scores (on a five-point scale), with a mean score of 4.3, indicating that they were perceived as more desirable outcomes from adopting healthy eating and exercise/physical activity habits. The benefits from the social/professional subscale received the greatest number of 1 and 2 scores with a mean score of 3.8, indicating less perceived desirability of these outcomes.

Three significant differences emerged between the mean scores on the physical health/fitness subscale based on gender, previous exposure to nutrition education, and academic major. Accordingly, females scored higher than males (4.2 ± 0.8 vs. 4.0 ± 0.8, $p = 0.010$), students who had taken a college/university level nutrition course scored higher than those who had not taken such a course (4.2 ± 0.7 vs. 4.0 ± 0.8, $p = 0.040$), and students majoring in physical or mental health-related disciplines scored higher than students in other majors (4.3 ± 0.7 vs. 4.0 ± 0.8, $p = 0.001$). No significant difference was found between the mean scores on the physical health/fitness subscale based on year in school ($p = 0.274$).

Three significant differences were found between the mean scores on the emotional/mental health subscale based on gender, previous exposure to nutrition education, and academic major. Accordingly, females scored higher than males (4.4 ± 0.7 vs. 4.2 ± 0.8, $p = 0.010$), students who had taken a college/university level nutrition course scored higher than those who had not taken such a course (4.4 ± 0.7 vs. 4.3 ± 0.7, $p = 0.034$), and students majoring in physical or mental health-related disciplines scored higher than students in other majors (4.5 ± 0.6 vs. 4.4 ± 0.8, $p < 0.001$). No significant difference was found between the mean scores on the emotional/mental health subscale based on year in school ($p = 0.313$).

A significant difference ($p = 0.015$) was found between the mean scores on the social/professional subscale based on previous exposure to nutrition education, such that students who had taken a college/university level nutrition course scored higher (4.0 ± 1.0) than those who had not taken such a course (3.8 ± 1.0). There were no significant differences found between the mean scores on the social/professional subscale based on gender ($p = 0.092$), year in school ($p = 0.070$), or academic major ($p = 0.054$).

A Pearson product-moment correlation coefficient (r = 0.489) was calculated to describe the association between the students' BMIs and their mean scores on the overall perceived benefits scale There was a statistically significant correlation ($p < 0.001$) between the students' BMIs and their mean scores on the overall perceived benefits scale, thus as students' BMI increased, the overall perceived benefits scale was rated higher.

Table 6

Mean Scores on Perceived Benefits Subscales

Subscale	Mean Score (SD)	Number of Responses
Physical Health/Fitness Making it easier to do the exercise or sports activities I enjoy Making me feel more energetic Increasing my chances of having good health now and in the future Improving a symptom or health problem that I have now Helping me become more physically fit to improve my job performance Helping me sleep better Making it easier for me to accomplish my daily activities like house cleaning, shopping, etc.	4.1 0.8	559
Emotional/Mental Health Reducing my depression, anxiety, or stress Helping me improve how I feel about my physical appearance Improving my self-esteem Making me feel more motivated to meet my academic goals Improving my mood	4.3 0.7	553
Social/Professional Increasing my chances of getting more dates Helping me meet my personal or professional goals Making me feel more comfortable around other people	3.8 1.0	563

4.8 Knowledge About Overweight/Obesity

The students' mean score on the three-question test about overweight/obesity was 2.6 points (± 0.6, range 1 to 3) out of a possible three points.

Three significant differences emerged between the mean scores on the knowledge test based on gender, previous exposure to nutrition education, and academic major. Accordingly, females scored higher than males (2.6 ± 0.6 vs. 2.4 ± 0.6, $p < 0.001$), students who had taken a college/university level nutrition course scored higher than those who had not taken such a course (2.7 ± 0.6 vs. 2.5 ± 0.6, $p = 0.003$), and students majoring in physical or mental health-related disciplines scored higher than students in other majors (2.7 ± 0.5 vs. 2.5 ± 0.6, $p < 0.001$). No significant differences were found between the mean scores on this test based on year in school ($p = 0.245$) or BMI ($p = 0.423$). The test question that was most often answered correctly was: "Which health problem could develop in a person who is overweight or obese?" with the correct answer being "high blood pressure," selected by 491 of the 560 students (88%) who answered the question. The question that was most often answered incorrectly was: "In which part of your body is it riskiest to have excess fat because it increases your risk of developing serious health problems?" with the correct answer being "abdomen," selected by 408 of the 560 students (73%) who answered the question.

Chapter Five: Discussion

5.1 Outcome of Hypothesis Testing and Interpretation of Results

The results of this study indicated that a significantly greater proportion of females were dissatisfied/very dissatisfied with their current weight compared to males, and more females than males perceived their weight status as overweight/obese. Furthermore, a significantly greater proportion of females than males reported attempting to lose weight during the previous 12 months. These results supported the study hypotheses that a significantly greater proportion of females than males would be dissatisfied/very dissatisfied with their current weight, perceive their weight status as overweight/obese, and attempt weight loss during the previous 12 months. Regarding weight loss attempts, other research has shown that females are more likely to report frequent weight loss attempts compared to males (Sira & Pawlak, 2010).

The findings regarding perceived severity of the health consequences associated with overweight/obesity suggest that previous exposure to nutrition education and academic major influence the perceived severity of these consequences. Specifically, these findings indicated that students who had taken a college/university-level nutrition course perceived these health consequences as significantly more severe than students who had not taken such a course. Additionally, students majoring in a physical or mental health-related discipline also perceived these consequences as significantly more severe than students pursuing majors in nonhealth-related disciplines. It is possible that some of the students majoring in health-related fields had previously taken a university/college-level nutrition course that included information about the potential adverse health impacts of overweight/obesity, and that this previous exposure may have influenced their responses. These results suggest that health and nutrition education are valuable resources for conveying information about the chronic diseases linked to excess adiposity. While

our findings did not indicate that there was a significant difference between male and female perceptions about the severity of consequences associated with overweight/obesity, However, other researchers have reported that males often do not recognize that their current health habits may have unfavorable impacts on their long-term health (Davies et al., 2000). This may explain why the male students were likely to perceive the consequences of overweight/obesity as less severe than the female participants.

Regarding the students' perceptions about their susceptibility to becoming overweight/obese, our findings indicated that females earned a significantly higher mean score than males on this scale, indicating that females felt more susceptible to developing these conditions. This result supports the study hypothesis that females would earn a significantly higher mean score than males on the perceived susceptibility scale, suggesting that females are more conscious of their weight status and body image (Cason & Wenrich, 2002). However, since no significant inverse correlation was found between the students' BMIs and their perceived susceptibility ratings, our hypothesis predicting such an association was not supported. It was believed that students classified as overweight/obese would not recognize signs of susceptibility to becoming overweight/obese because the activities listed in the questionnaire could be considered acceptable and frequently practiced behavior. However, the results indicated that BMI did not influence perceived susceptibility of becoming overweight/obese, possibly suggesting that weight status does not indicate how knowledgeable students are toward perceived susceptible of becoming overweight/obese. Likewise, the third/fourth year students mean score was significantly higher than first/second year students on the perceived susceptibility scale, in opposition of supporting our hypothesis. This could be due to a greater percentage of third and fourth year students living off-campus compared to first and second year students. Previous

studies have shown that students who live off-campus had increased health risks, such as being overweight or obese (Brunt & Rhee, 2008). It is possible that these off-campus students engaged in unhealthy eating and exercise behaviors more, thus influencing their perceived susceptibility score more than on-campus students. Nutrition interventions that focus on food prep and grocery shopping for independent living could be quite beneficial to students living off campus and may improve perceived susceptibility to becoming overweight/obese.

The findings concerning barriers to adopting healthy eating and physical activity habits to achieve a healthy weight revealed that females earned a significantly higher mean score than males on this scale, supporting our study hypothesis. Previous research has shown that barriers to adopting health-related behaviors significantly and negatively influence behavioral intentions among females, but not among males (Deshpande, Basil, & Basil, 2009). Additionally, we hypothesized that first/second year students would earn a significantly higher mean score than third/fourth year students on the perceived barriers scale, and that students majoring in a physical or mental health-related discipline and students who had taken a college/university-level nutrition course would earn a significantly lower mean score on this scale. However, neither year in school, academic major, nor having taken a university/college-level nutrition course were significantly associated with the students' mean scores on the perceived barriers scale. It was hypothesized that first/second year students would score higher barriers possibly due to limited meal preparation experience and availability of kitchen appliances and utensils. The non-significant results could be attributed to the barrier survey questions. Additional questions about the accessibility to adequate kitchen resources and limited knowledge of meal preparation hindering nutritional choices may have offered a significant score difference. Furthermore, it was speculated that students in health-related disciplines and students who had taken a

university/college-level nutrition course would have a significantly lower barrier score. It is possible that health and nutrition courses offered to students did not focus or have a high enough impact on educating overcoming barriers to healthy life choices, thus perception was not influenced by education. A significant positive correlation was found between the students' BMIs and their scores on the perceived barriers scale, indicating that as the students' BMIs increased, the items in this scale were perceived as stronger obstacles to adopting healthy eating and physical activity habits to achieve a healthy weight. Overweight status can have a negative impact on self-esteem, as noted in previous research (Van Den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010)

The findings regarding internal and external cues to adopting healthy eating and physical activity habits suggest that neither gender nor year in school influence internal cues to these adopting these habits. We hypothesized that internal cues would motivate females to adopting healthy eating and physical activity habits more than males, but these findings indicated that there was no significant difference between the means scores on the internal cues subscale based on gender. Thus, our hypothesis was not supported. Furthermore, there was no significant difference between the mean scores on the internal cues subscale for first/second year students and third/fourth year students. However, the findings suggest that year in school does influence external cues to adopting these habits. First/second year students had higher mean scores on the external cues subscale than third/fourth year students, suggesting that less experienced students may internally perceive outside sources to be more influential toward making a behavior change. Finally, there was a significant inverse correlation between the students' BMIs and their scores on the internal and external cues scales. Specifically, as BMI increased, scores for both internal and external cue subscales decreased, suggesting that weight status in addition to motivators to

action influences students' cues to adopting healthy eating and physical activity habits. According to James et al., students with higher BMIs may feel less motivated to adopt healthy behaviors due to a fear of failing or accepting their body "as is" (2012).

Concerning the potential benefits of adopting healthy eating and physical activity habits to achieve a healthy weight, our results indicated that females earned a significantly higher mean score than males on the perceived benefits scale. This finding did not support our null hypothesis, and suggests that females were more likely to believe that they could achieve a healthy weight by practicing healthy eating and physical activity habits than males. Other researchers have previously reported that female participants earned significantly higher mean scores on scales assessing attitudes toward the benefits of eating a healthy diet (Deshpande et al., 2009), further supporting gender-based differences in perceived benefits. Females may have more positive attitudes toward the benefits of eating healthy and doing physical activity than males because they influenced more by weight status and social acceptance. (Edman et al., 2005) Additionally, students majoring in physical or mental health-related disciplines earned a significantly higher mean score on the perceived benefits scale than students in nonhealth-related majors, suggesting that the former group are more inclined to believe in the health-promoting benefits of healthy eating and undertaking regular physical activity. Educational curricula may be the most influential factor for students in physical or mental health-related disciplines, as classes within these majors may focus more on benefits to practicing healthy eating and physical activity behaviors. There was a statistically significant positive correlation between the students' BMIs and their scores on the perceived benefits scale, indicating that as the students' BMIs increased, the items on the benefits scale were more strongly perceived as beneficial for achieving a healthy weight. This finding did not support our hypothesis that predicted a

significant inverse correlation between the students' BMIs and their scores on this scale. Our findings support those of other investigators working with college student samples who reported that their students believed that improvement in their dietary and physical activity habits would not have a direct impact on their current health and, therefore, were not planning to adopt healthier habits (Cason & Wenrich, 2002).

Finally, the findings regarding knowledge about overweight/obesity suggest that gender, previous exposure to nutrition education, and academic major influence knowledge. Specifically, these findings indicated that females knew significantly more about overweight/obesity than males. Additionally, student who had taken a college/university-level nutrition course knew significantly more about overweight/obesity than students who had not taken such a course, and students majoring in a physical or mental health-related discipline also knew significantly more about overweight/obesity than students pursuing majors in nonhealth-related disciplines. However, year in school was not significantly associated with students' mean scores for the knowledge questions, possibly suggesting that educational curricula may be influential toward students' knowledge of overweight/obesity than experience in school.

The findings from this study indicate that our participants could benefit from lifestyle interventions that focus on the environmental and physiologic factors which contribute to the onset of overweight and obesity, possible health consequences of these conditions, the potential benefits of adopting healthy dietary and physical activity behaviors, and how to overcome perceived barriers to these behaviors. These activities should be tailored to the needs of specific student groups, i.e., males and females, younger and older students, students pursuing health-related and other majors, and students from various race/ethnic affiliations. For example, several items related to emotional and mental health problems from the perceived barriers scale (e.g.,

lack of motivation for adopting healthy eating and physical activity habits, deriving enjoyment from eating fried and sugary products, deriving comfort from eating, and feeling depressed, anxious, or stressed) were perceived as strong barriers that prevented students from eating healthy and undertaking regular physical activity to avoid becoming overweight or obese. Other items from the perceived barriers scale focusing on practical concerns also received high ratings, indicating that these concerns represented obstacles for choosing healthy foods and engaging in daily physical activity to achieve a healthy weight. These Practical concerns included the high cost of low-calorie products, the excessive amount of time it would take to shop for healthy foods and to undertake physical activity on most days, and having a greater appreciation for a job or for studying than for adopting healthy eating and physical activity habits. These findings suggest that these student concerns need to be taken into consideration when designing nutrition and physical activity education activities. Such activities should convey the message that shopping for and preparing nutrient-dense foods and undertaking daily physical activity can be worked into the daily routine of busy student lives without jeopardizing study or work-time. Time and cost concerns can be accommodated by incorporating skill-building for time and budgetary management. For example, interactive workshops could offer instruction on how to plan weekly menus that include palatable, lower-cost, and nutritious meals that can be prepared in a short amount of time. Recipes for meals and snacks featuring vegetables, fruits, whole grains and cereals, low-fat dairy foods, and legumes could be posted on websites or emailed to interested students.

The benefits from adopting healthy eating and physical activity habits that received the highest student ratings concerned improvement of the same emotional and mental health problems that were highly rated as barriers to adopting healthy dietary and physical activity

behaviors, i.e., feeling depressed, anxious, and stressed. Other benefits that were highly rated were: help meet personal and professional goals, improve feelings toward physical appearance, self-esteem, and mood, and increase motivation to meet academic goals. Therefore, interventions such as group counseling sessions and support group meetings facilitated jointly by registered dietitians and psychologists that teach techniques for coping with emotional and mental health challenges and that encourage students to share their experiences may assist students to better manage the emotional and mental health problems that were perceived as barriers and to derive the perceived benefits from adopting healthy behavior changes. Other types of educational activities such as presentations by students who have successfully managed their psychological challenges and have adopted healthy lifestyle behaviors for health promotion, interactive food preparation and physical activity demonstrations offered in residence halls and in sorority and fraternity houses and at on-campus health fares could serve to reinforce the benefits derived from healthy behavior change.

Several behaviors from the perceived susceptibility scale related to unhealthy eating (e.g., frequent consumption of sugary products, frequent consumption of fried foods, eating at fast food restaurants three or more times per week, and not paying attention to amounts of food or beverages consumed) and sedentarism (e.g., getting less than 30 minutes of moderate-intensity physical activity on most days) also received high ratings from the participants, indicating that these behaviors were regarded as risk factors for becoming overweight or obese. Ample research has shown that regular consumption of energy-dense diets and little physical activity can contribute to excess adiposity and associated chronic diseases (Pereira et al., 2005; Matthews et al., Patterson et al., 2004)

Since these findings from the susceptibility scale are supported by scientific evidence, they should be reinforced in interventions that focus on the benefits of adopting a lifestyle that includes a daily diet featuring nutrient-dense foods and regular physical activity for risk reduction.

5.2 Study Strengths and Limitations

The prevalence of overweight/obesity among college students is on the rise, and is associated with numerous unfavorable health consequences (Patterson et al., 2004). The findings from the present study contribute to the understanding of the weight-related perceptions of college students by grounding data collection and analysis in the constructs from the Health Belief Model (HBM). The constructs in this model allow nutrition educators to tailor interventions to the specific needs of student subgroups. Another strength was the use of computer technology for recruitment and questionnaire administration. The recruitment of participants through large email blasts and the administration of the questionnaire using Qualtrics survey software allowed for a greater number of completed questionnaires to be collected in a shorter amount of time compared to on-site recruitment and administration. The sample size in turn allowed for analysis of data based on student demographic characteristics. The use of an online questionnaire also simplified the task of exporting the collected data to a statistical software for analysis.

The findings from this study should be interpreted in light of several limitations. One limitation was the overrepresentation of females in the sample which may have introduced a gender bias into the findings. Additionally, the student enrollment at the University is predominantly white, not of Hispanic origin, limiting the race/ethnic diversity of the sample.

Additionally, the study was conducted on only one campus. These limitations prevent the generalizability of the findings to the nation-wide population of college students.

5.3 Areas for Future Research

The HBM consists of several variables, and many health beliefs were explored in this study. However, due to some constraints, we were unable conduct research on self-efficacy of adopting healthy eating and physical activity habits for college students. Future research should include a focus on self-efficacy of college students and adopting healthy eating and physical activity habits and compare results to certain demographics as age, gender, major in school, or ethnicity. Future research may benefit by also applying this questionnaire toward a larger, more diverse university. Furthermore, it would be interesting to see this type of research aimed at other age groups such as high school students, as the collected data could be very beneficial toward developing nutrition education and interventions with secondary education.

5.4 Conclusions

The use of the HBM allowed for greater insight on the beliefs of college students regarding health. Specifically, the HBM targeted important variables that affect attitude and behavior toward practicing healthy eating and physical activity/exercise habits. Furthermore, the HBM acted as a guideline for designing the current survey, and we were able to obtain a well-rounded perspective of the mindset of college students toward weight status and health. Finally, the HBM allowed us to shape the survey to specifically target a college population, and it was used as a general outline in which we developed questions that corresponded with each HBM variable. Thus, the HBM is an excellent tool to use for future research, as it can be incorporated into multiple situations that involve measuring attitudes and beliefs of a population.

Regarding the results of the current research, there was quite a bit of gender stratification for several of the HBM variables. In general, Female participants appeared more concerned about maintaining a healthy weight status and practicing healthy eating and physical activity/exercise behaviors in comparison to males. Additionally, year in school and students' majors also appeared to influence beliefs about overweight/obesity. Overall, the findings of this study highlight the importance of incorporating educational interventions on college campuses that aim to improve the behaviors and attitudes toward practicing a healthy lifestyle. The findings also suggest that for nutrition education to be effective with college students, it needs to focus on the management emotional/mental health problems, the benefits of practicing healthy eating and physical activity/exercise habits, and how to successfully overcoming barriers of practical concerns. Finally, if interventions are to be effective, thorough research should be considered beforehand to assess the needs of the students, as number of variables can influence attitudes and behavior.

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Appendix A: Consent Letter

Greetings ASU Student!

You are invited to participate in a survey study about the beliefs and knowledge of undergraduate and graduate students enrolled at Appalachian State University concerning body weight, eating habits, and exercise/physical activity habits. This study is being conducted by Ms. Alysse Riggs and Ms. Franchesca Uribe, a graduate and an undergraduate student, respectively, in the Department of Nutrition and Health Care Management, under the direction of Dr. Laura McArthur, a faculty member in that department.

If you agree to participate, we will ask for about 10 to 15 minutes of your time to complete an anonymous, self-administered, online questionnaire. Your participation in this study is strictly voluntary, and you are free to stop answering questions at any time.

We do not anticipate that you will experience any discomfort or inconvenience from completing this questionnaire, other than the time it takes to answer the questions. Please understand that no compensation of any kind or academic credit is being offered for your participation. However, the answers you provide would be very valuable to us since your input will help us design learning opportunities for college students about achieving and maintaining a healthy weight for long-term health promotion.

We assure you that the answers you give will be anonymous. Only group answers, not individual answers, will be used to write an article for publication based on this research.

Should you experience any psychological discomfort from your participation in this research, we encourage you to contact the Counseling Center on the campus of Appalachian State University located on the first floor of the Miles Annas Building at 614 Howard Street. You can also contact them by telephone at (828) 262-3180.

Thank you for considering this invitation. If you have any questions about this research, please get in touch with any of the three investigators using the contact information given below.

The Appalachian State University Institutional Review Board (IRB) has determined that this study is exempt from IRB oversight. By continuing on to the survey, you acknowledge that you are over 18 years old and that you have read and agreed to the descriptions and terms outlined in this consent form, and that you voluntarily agree to participate in this research.

Respectfully,
Laura McArthur, PhD, RD; telephone (828) 262-2971; e-mail mcarthurlh@appstate.edu;
Alysse Riggs, Graduate student; telephone (865) 323-5966; e-mail riggsa@appstate.edu;
Franchesca Uribe, Undergraduate student; telephone (828) 434-0184; e-mail uriberheinboltf@appstate.edu.

Appendix B: Survey Instrument

Part One Please click the button that best reflects your answer choice or type your information in the spaces provided.

1. Which term BEST reflects how you would describe your current weight?
A. Underweight B. Neither overweight nor underweight C. Overweight D. Obese

2. How satisfied are you with your current weight?
A. Very satisfied B. Satisfied C. Dissatisfied D. Very dissatisfied

3. Have you tried to lose weight in the past 12 months?
A. Yes B. No

4. What is your approximate weight? (Round to the nearest pound)
_____

5. What is your approximate height? _____ feet _____ inches

Part Two Please **use these definitions to complete the following questions.**
"Healthy eating habits" means consuming fewer fried, high-fat, high-calorie, and sugary beverages, foods, and snacks and more lean meats, fish, poultry, fruits, vegetables, and whole grain foods.
"Healthy exercise/physical activity habits" means doing at least 30 minutes of moderate-intensity activities like taking formal exercise classes, brisk walking, jogging, dancing, playing sports, gardening, housework, etc. on most days.

6. Rate how severely you believe each possible **consequence** of being overweight or obese would affect you personally by clicking a button from 1 to 5, where 1 means "not at all severe" and 5 means "extremely severe."

Being overweight or obese could...

A. Have an unfavorable effect on my general health in years to come
1 2 3 4 5

B. Make it harder to do the exercise or sports activities I enjoy
1 2 3 4 5

C. Make it harder to get enough restful sleep

1 2 3 4 5

D. Cause pain in my knees

1 2 3 4 5

E. Make me feel depressed, anxious, or stressed

1 2 3 4 5

F. Increase my risk for developing diabetes

1 2 3 4 5

G. Make it harder to make friends

1 2 3 4 5

H. Make it harder to get the internship or job I want because of weight discrimination

1 2 3 4 5

I. Take some of the fun out of socializing with friends

1 2 3 4 5

J. Increase my risk for developing heart disease

1 2 3 4 5

K. Make it harder to get dates

1 2 3 4 5

L. Increase my risk for developing high blood pressure

1 2 3 4 5

M. Cause other people to find me less physically attractive

1 2 3 4 5

N. Make me unhappy

1 2 3 4 5

O. Make it harder to get into a graduate or professional program because of weight discrimination

1 2 3 4 5

P. Increase my risk for developing some type of cancer

1 2 3 4 5

Q. Lower my self-esteem

1 2 3 4 5

R. Other: Please describe and rate.

_____

1 2 3 4 5

7. Rate each factor according to how much you believe it could make you **susceptible** (at risk) to becoming overweight or obese by clicking a button from 1 to 5, where 1 means "not at all susceptible" and 5 means "extremely susceptible."

I could be susceptible to becoming overweight or obese if...

A. One or both of my parents is overweight or obese

1 2 3 4 5

B. I get less than 30 minutes of moderate-intensity exercise/physical activity on most days

1 2 3 4 5

C. I consume sugary beverages, foods, or snacks daily or on most days.

1 2 3 4 5

D. My race/ethnic group has a high occurrence of overweight and obesity

1 2 3 4 5

E. I eat fried foods or snacks daily or on most days

1 2 3 4 5

F. I eat at fast food restaurants three or more times/week

1 2 3 4 5

G. I don’t pay attention to the amount I eat or drink

1 2 3 4 5

H. Other: Please describe and rate.

_____

1 2 3 4 5

8. Rate each possible **barrier** according to how strongly it could prevent you from adopting healthy eating and exercise/physical activity habits to achieve and maintain a healthy weight by clicking a button from 1 to 5, where 1 means "not at all a barrier" and 5 means "a very strong barrier."

A. I am not motivated to adopt healthy eating and exercise/physical activity habits

1 2 3 4 5

B. I enjoy eating fried foods and snacks more than baked, steamed, or grilled versions

1 2 3 4 5

C. I don't know where to find accurate information about how to achieve and maintain a healthy weight

1 2 3 4 5

D. I enjoy consuming sugary beverages, foods, and snacks more than lower-calorie versions

1 2 3 4 5

E. Lower-calorie beverages, foods, and snacks are too expensive

1 2 3 4 5

F. I don't know how to plan regular exercise/physical activity into my daily schedule

1 2 3 4 5

G. Grocery shopping for healthy foods would take up too much of my time.

1 2 3 4 5

H. I don't know where to shop for healthy beverages, foods, or snacks

1 2 3 4 5

I. Doing exercise/physical activity on most days would take up too much of my time.

1 2 3 4 5

J. I often turn to food when I want to feel comforted

1 2 3 4 5

K. I don't know how to prepare lower-calorie beverages, foods, or snacks

1 2 3 4 5

L. I often feel depressed, anxious, or stressed, and it makes it hard to adopt healthy eating and exercise/physical activity habits

1 2 3 4 5

M. My job or studying means more to me than adopting healthy eating and exercise/physical activity habits

1 2 3 4 5

N. I don't know how to choose healthy beverages, foods, or snacks

1 2 3 4 5

O. Other: Please describe and rate.

_____

1 2 3 4 5

9. Rate how strongly each factor would **motivate** you to adopt healthy eating and exercise/physical activity habits to achieve and maintain a healthy weight by clicking a button from 1 to 5, where 1 means "not at all motivating" and 5 means "strongly motivating."

I would adopt healthy eating and exercise/physical activity habits if...

A. I looked in the mirror and I was dissatisfied with my body

1 2 3 4 5

B. A physician, nurse, or dietitian advised me to achieve and maintain a healthy weight

1 2 3 4 5

C. My clothes fit uncomfortably tight

1 2 3 4 5

D. I developed a health problem that could be improved by achieving and maintaining a healthy weight

1 2 3 4 5

E. I believed that others were judging me unfairly based on my weight

1 2 3 4 5

F. A loved one developed a serious health problem from being overweight or obese

1 2 3 4 5

G. Being at a healthy weight would help me achieve my personal or professional goals

1 2 3 4 5

H. A family member or close friend advised me to achieve and maintain a healthy weight

1 2 3 4 5

I. I was presented with information about the health risks of being overweight or obese in a college course

1 2 3 4 5

J. My partner or significant other advised me to achieve and maintain a healthy weight

1 2 3 4 5

K. I read on a social media website (e.g., Facebook, Twitter, Pinterest, Instagram, etc.) about the health risks of being overweight or obese

1 2 3 4 5

L. Achieving and maintaining a healthy weight would improve my depression, anxiety, or stress

1 2 3 4 5

M. I was presented with information about the health risks of being overweight or obese in a radio, television, or podcast program

1 2 3 4 5

N. I saw an advertisement for a product or service that claimed it would help me to achieve and maintain a healthy weight

1 2 3 4 5

O. Other: Please describe and rate.

_____

1 2 3 4 5

10. Rate how beneficial you would find each possible outcome of adopting healthy eating and exercise/physical activity habits to achieve and maintain a healthy weight by clicking a button from 1 to 5 where 1 means "not at all beneficial" and 5 means "highly beneficial."

It would benefit me to adopt healthy eating and exercise/physical activity habits by...

A. Making it easier to do the exercise or sports activities I enjoy
1 2 3 4 5

B. Making me feel more energetic
1 2 3 4 5

C. Reducing my depression, anxiety, or stress
1 2 3 4 5

D. Helping me meet my personal or professional goals
1 2 3 4 5

E. Increasing my chances of getting more dates
1 2 3 4 5

F. Helping me improve how I feel about my physical appearance
1 2 3 4 5

G. Increasing my chances of having good health now and in the future
1 2 3 4 5

H. Improving a symptom or health problem that I have now
1 2 3 4 5

I. Helping me become more physically fit to improve my job performance
1 2 3 4 5

J. Improving my self-esteem
1 2 3 4 5

K. Making me feel more comfortable around other people
1 2 3 4 5

L. Making me feel more motivated to meet my academic goals

1 2 3 4 5

M. Helping me sleep better

1 2 3 4 5

N. Making it easier for me to accomplish my daily activities like house cleaning, shopping, etc.

1 2 3 4 5

O. Improving my mood

1 2 3 4 5

P. Other: Please describe and rate. _____

1 2 3 4 5

Part Three Please answer these final questions by clicking the button that best reflects your choice or by typing your answer in the spaces provided.

11. Which factor contributes to the development of overweight and obesity?

A. Overweight or obesity runs in the family
B. Leading a sedentary (no physical activity) lifestyle
C. Frequently consuming sugary beverages, foods, or snacks
D. All of the above

12. In which part of your body is it MOST risky to have excess fat because it increases your risk of developing serious health problems?

A. Chest B. Abdomen (stomach) C. Arms D. Hips

13. Which health problem could develop in a person who is overweight or obese?

A. High blood pressure C. Anemia
B. Asthma D. Stomach ulcers

14. My gender is A. Male B. Female C. Other: _____

15.My age is (years) _____

16. My year at Appalachian State is

A. First year B. Sophomore C. Junior D. Senior E. Graduate student

17. I have taken a college/university level nutrition course A. Yes B. No

18. My ethnic affiliation is

A. White, not of Hispanic origin
B. Hispanic
C. Black, not of Hispanic origin
D. Black, of Hispanic origin
E. Asian
F. Native American/Alaska Native
G. Pacific Islander
H. Other: _____

19. My major is

A. Related to physical or mental health (e.g. exercise science, nursing, nutrition, psychology, etc.)
B. Not related to physical or mental health (e.g. anthropology, biology, business, English, languages, sociology, sustainable development, etc.)
C. I have not chosen a major yet

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Vita

Alysse Marie Riggs was born in St. Louis, Missouri, to Eddie and Barbara Riggs. She graduated from Oak Ridge High School in 2011. She entered the University of Tennessee Knoxville to study nutrition in 2012; in May 2015, she was awarded the Bachelor of Science of Health and Human Sciences in Nutrition. In the fall of 2015, she was accepted into the combined Masters of Science in Nutrition and Dietetic Internship program at Appalachian State University. Alysse hopes to excel at her future career as a Registered Dietitian Nutritionist with a focus in community outreach.