ASSESSING THE EFFECTIVENESS OF A NUTRITION INTERVENTION ON COLLEGE STUDENTS: A PILOT STUDY

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Assessing the Effectiveness of a Nutrition Intervention on College Students:

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This thesis is dedicated to my family for their constant support and reassurance, and Kevin for keeping me sane throughout this process.
ABSTRACT OF THE THESIS

Assessing the Effectiveness of a Nutrition Intervention on College Students: A Pilot Study
by
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Master of Public Health with a Concentration in Health Promotion and Behavioral Science
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This study assessed the effectiveness of a pilot program aimed at improving college students’ eating behaviors. Fifty-three undergraduate students aged 18-25 years old from San Diego State University were recruited for the study. Pre and post self-report questionnaires were collected from students that attended the Nutrition Basics Peer Led workshops at the Health Promotion Department of Student Affairs, the Activities and Recreation Center and the residence halls during the spring and fall semesters of 2013. An electronic follow-up survey was sent one month after participation in the workshop.

Paired sample t-tests were used to detect differences in perceived norms, attitude, personal agency, and intentions post intervention. A change in knowledge from baseline to post intervention was assessed using a one-way ANOVA. Knowledge retention from post-intervention to one month follow-up was analyzed using the Wilcoxon ranked-sum test. Knowledge at follow-up was also compared to knowledge at baseline using the Wilcoxon ranked-sum test. Participants’ eating behaviors at baseline were compared to eating behaviors at follow-up using the Wilcoxon ranked-sum test. There were statistically significant changes in knowledge, personal agency, perceived norms, intentions, and eating behaviors post-intervention and at follow-up. Information from this pilot study can assist the Health Promotion Department of Student Affairs in tailoring future nutrition programming for the college population.
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CHAPTER 1

INTRODUCTION

BACKGROUND

Between 1980 and 2000, obesity rates doubled among adults and the rates of overweight adolescents tripled (Centers for Disease Control and Prevention [CDC], 2010). According to the CDC (2012), 33.3% of adults age 20 years and over are overweight and 35.9% of adults 20 years and over are obese. The Behavioral Risk Factor Surveillance System, a national cross-sectional telephone survey of women and men aged 18 years of age and older, has shown that the most substantial increases in overweight and obesity occurred in young adults, 18-29 years of age (Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). Additionally, the National Collegiate Health Risk Survey indicated that 1 in 5 college students are overweight (Butler, Black, Blue, & Gretebeck, 2004). However, the rates of obesity and overweight among young adults have only been this high in the last decade. In 1991, 12% of college students were obese, but by 2004 the prevalence tripled to 36% (Ogden et al., 2006).

While more recent national data shows a leveling off of this trend (Flegal, Carroll, Kit, & Ogden, 2012), these rates are still high, demonstrating the need for health promotion programs to improve the health behaviors of young adults. Healthy Campus 2020 recognized the need to increase preventive efforts aimed at promoting “quality of life, healthy development, and positive health behaviors” among college students and encouraged college campuses nationwide to strive for better overall health (American College Health Association, 2012). The objectives related to nutrition and weight status included: increase the proportion of students who report receiving nutrition education from their institution, increase the proportion of students who are at a healthy weight by 10%, increase the proportion of students who report eating five or more fruits and vegetables per day by 10%, and reduce the proportion of students who are obese by 10% (American College Health Association, 2012). Since young adulthood may be a critical time during which young people establish independence and adopt new health behaviors (Nelson, Story, Larson, Neumark-
Sztainer, & Lytle, 2008), programs that assist campuses in meeting objectives set by Healthy Campus 2020 should be implemented.

In 2013, the San Diego State University’s (SDSU) Health Promotion Department of Student Affairs lost its registered dietician and with it nutrition counseling, which at the time was the foundation of nutrition education and assistance provided to students. Since one-on-one nutrition counseling was no longer available, there was a need to create, implement and evaluate nutrition programming. Additionally, many other California State Universities have nutrition education and programming available to their students. Since SDSU did not have any nutrition outreach available, there was a gap in service, further showing the need to develop an innovative pilot program with a low amount of barriers (walk-in, offered at several times, marketing explains that this is basic info and a large knowledge base is not necessary to attend) that would appeal to the students. Based on the Healthy Campus 2020 objectives and evidence-based research, the Nutrition Basics workshops were created as a way for SDSU students to receive reliable nutrition information and to prompt students to take the initial steps in making healthier eating choices. A pilot test of this program was designed to serve as the basis on which other, more tailored and targeted programming would be developed in the future.

**STATEMENT OF THE PROBLEM**

According to the National Longitudinal Study of Adolescent Health, the transition from adolescence to young adulthood results in a significant increase in adolescents becoming and remaining obese (Gordon-Larsen, Adair, Nelson, & Popkin, 2004). This study followed a nationally representative cohort of 9,795 adolescents into young adulthood and found that 5-year incidence of obesity was nearly 13%, but only 1.6% shifted from obese to nonobese (Gordon et al., 2004). Results from a another longitudinal study analyzing the effects of weight maintenance or gain in 5,115 young adults (age 18-24), indicated that 16.3% of young adult participants maintained a stable or decreased BMI over the 15 years of follow-up, but 73.9% of participants had an increase in BMI >2 kg/m² during young adulthood. While it is expected that BMI will slightly increase as young adults continue to develop, participants with an increased BMI over time had worsening levels of metabolic
syndrome components (Lloyd-Jones et al., 2007) demonstrating the importance of weight maintenance rather than gain.

Since individuals that develop obesity at a young age are more likely to experience negative long-term health outcomes such as diabetes, hypertension, and sleep apnea earlier in life (Desai, Miller, Staples, & Bravender, 2008), and the obesity rates are increasing in college students, it is likely that they will start to experience the side effects related to obesity at a younger age than people who become obese later in life. However, by educating college students about the importance of healthy eating behaviors and giving them the skills to make lifestyle changes, these health consequences may be avoided (Abood, Black, & Birnbaum, 2004; Gow, Trace, & Mazzeo, 2010; Ha & Caine-Bish, 2009). Research aimed at improving young adults’ eating behaviors is limited and the transition from adolescence to young adulthood in understudied. Therefore, this pilot program will help fill the gap in the literature by assessing the effectiveness of an intervention aimed at improving college students’ eating behaviors.

**PURPOSE OF THE STUDY**

The purpose of this pilot study was to assess the effectiveness of a healthy eating intervention among college students at San Diego State University. The intervention consisted of a “Nutrition Basics” workshop with pre-, post- and follow-up self-report questionnaires. The study’s primary goals were to assess whether a single nutrition workshop led by peer health educators could influence participants’ knowledge, attitudes, perceived norms, perceived behavioral control and intentions to eat healthy. Additionally, the follow-up survey sent one month post intervention investigated whether a significant change in participants’ healthy eating behaviors occurred. The results from this study will be used to tailor future health education interventions offered to San Diego State University students by the Peer Health Education program.

**THEORETICAL BASES AND ORGANIZATION**

The Integrated Behavioral Model (IBM) is an extension of the Theory of Planned Behavior (TPB). While the two health behavior theories are similar, there are distinct differences between the two. First, the TPB only measures perceived behavioral control as
one of the predictors of intention, but the IBM includes both perceived behavioral control and self-efficacy. The combination of the two constructs is defined as an individual’s personal agency and predicts intention to perform a behavior (Glanz, Rimer, & Viswanath, 2008). Second, knowledge and skills are a construct that also determines behavior. If a person knows how to eat healthy, then it is more likely that they will engage in the behavior. Third, norms, which are standards of beliefs, are measured differently in the IBM. The TPB refers to this construct as subjective norm, which is comprised of one’s individual beliefs and motivation to comply (Glanz et al., 2008). However, the IBM uses the term perceived norm, a combination of injunctive and descriptive norm. Injunctive norm refers to normative beliefs about other people’s expectations for that individual to engage in the given behavior. For example, individuals may have stronger intentions to eat healthy if they believe that people expect them to eat healthy. Descriptive norm refers to normative beliefs about other’s behaviors. If an individual doesn’t believe that people close to them eat healthy, then their intentions to eat healthy may decrease.

Similar to TPB, the most important determinant of the IBM is intention. Without intention, an individual is less likely to carry out a behavior. Behavioral intention is determined by attitude, perceived norms, and personal agency. Knowledge and skills also directly influence an individual’s behavior. Information related to constructs of the IBM was integrated into the curriculum during the planning phase of this pilot program, and evaluations of the Nutrition Basics workshop were driven by the theoretical framework of the IBM. Therefore, based on the assumptions of the IBM, the following hypotheses are proposed:

1. There will be a significant positive change in participants’ knowledge of healthy eating skills from baseline to post intervention and follow-up.
2. There will be a significant positive change in participants’ attitudes towards healthy eating, perceived norms of healthy eating, personal agency and intentions to eat healthy.
3. There will be a significant positive change in participants’ eating behaviors one month after the intervention.

**Limitations of the Study**

The primary limitation of this study was the small sample size at follow-up, which limited the statistical analyses. Although incentives were offered, the return rate of the
electronic follow-up survey was low. It was not possible to analyze the outcome of interest, eating behavior change, as initially planned. In the future, it may be worthwhile to schedule a follow-up appointment with the participants at Health Promotion to have them complete the follow-up survey and offer the incentive at that appointment. Additionally, this study was not a randomized controlled trial. Any changes in participants’ eating behaviors that were seen in the small sample at follow-up may not be directly attributed to the intervention. Limited funding and time for recruitment resulted in less students attending the workshops than anticipated. Finally, although the Peer Health Educators conducting the workshops have been thoroughly and systematically trained, there may be minor discrepancies in the delivery of the information based on individual style of presenting and education, which could lead to change in the ability of the subject to internalize the information or alter their motivation to change their behaviors. It should also be noted that the workshops are conducted with a varying amount of students in attendance, dependent purely on the number of students who show up for each session.

**DEFINITIONS OF TERMS**

- **Healthy Eating**: According to the Fat- and Fiber-related Diet Behavior Questionnaire (Shannon, Kristal, Curry, & Beresford, 1997), “around one third of what you eat each day should be fruit and vegetables, one third should be bread, potatoes, pasta and rice and one third should be split between milk and dairy products and meat, fish, pulses etc. Fatty foods (e.g. chips, crisps) and sugary foods (e.g. cake, sweets) should be kept to a minimum” (Payne, Jones, & Harris, 2004).

- **College Student**: An undergraduate student aged 18-25 years old.

- **BMI (Body Mass Index)**: A measurement calculated from a person's weight and height. According to the CDC (2011), “BMI is a fairly reliable indicator of body fatness for most people”. Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703. Formula: \[\text{weight (lb)} / \text{[height (in)]}^2 \times 703\] (CDC, 2011).

- **Overweight**: An adult who has a BMI between 25 and 29.9 is considered overweight.

- **Obese**: An adult who has a BMI of 30 or higher is considered obese.

- **Perceived Norm**: This term reflects the social pressure one feels to perform a particular behavior (Glanz et al., 2008).

- **Personal Agency**: This term consists of self-efficacy and perceived behavioral control. Perceived behavioral control is defined as one’s perceived amount of control over behavioral performance based on the environmental constraints that make it easy
or hard to carry out a behavior. Conversely, self-efficacy is one’s degree of confidence in their ability to perform the behavior (Glanz et al., 2008).

- **Intention:** Perceived likelihood of performing the behavior (Glanz et al., 2008).
- **Self-Efficacy:** An individual’s confidence in their ability to perform a behavior
CHAPTER 2

LITERATURE REVIEW

The transition from adolescence to adulthood can be stressful due to the increased independence, responsibilities and choices associated with this stage of life. One of the most influential and prevalent experiences among young adults is attending college. In fact, nearly half of all Americans aged 17-24 are enrolled in a postsecondary institution (American College Health Association, 2013). For some students, attending a four year university may include moving away from home and immersing themselves in an entirely new environment. Their new surroundings may consist of positive and negative influences that all contribute to shaping their future behaviors, specifically in regards to health. Students may adopt new dietary and physical activity habits, experiment with alcohol or drugs, engage in risky sexual behaviors, and endure high levels of stress from the academic and social rigor (Von Ah, Elbert, Ngamvitroj, Park, & Kang, 2004).

Evidence shows that eating habits are shaped early in life (Savage, Fisher, & Birch, 2007). Nevertheless, college students are presented with a new environment which may influence a change in food choice and nutrient intake. Dining commons offer students many options, but a majority of them provide calorie laden and high fat foods like cheeseburgers, pizza, fried foods and desserts on a daily, buffet style basis. The “all you can eat” nature of the dining commons and an increase in alcohol intake are both associated with students consuming excess calories (Nelson et al., 2008). Therefore, even if a student had healthy eating behaviors upon beginning college, it is possible that those eating behaviors could change as a result of their new surroundings.

Additionally, high levels of stress are associated with people eating large amounts of sugary and high fat foods and increased levels of alcohol consumption in adults (Laitinen, Ek, & Sovio, 2002). College students often experience increased levels of stress because of demanding academic schedules, financial situations, lack of time management and balancing recreational activities. The increase in stress triggers a change in eating behaviors, which typically consists of an increased appetite for sweet and salty foods (Bennett, Greene, &
Schwartz-Barcott, 2013; Kandiah, Yake, & Willett, 2008). Calorie dense food choices may provide students comfort when stressed; but have little nutritional value, and also put students at a risk for an energy imbalance.

Even though exercise is proven to have health promoting benefits, research shows that physical activity levels steadily decline with age (Von Ah et al., 2004). The most dramatic decline in physical activity is found from adolescence to young adulthood, resulting in college students engaging in an insufficient amount of physical activity (Kilpatrick, Hebert, & Bartholomew, 2005). Lack of physical activity is shown to have negative health consequences and puts people at risk for obesity. Therefore, considering the sharp decline in activity experienced by college students, this age group is specifically at risk for potential weight gain.

**Weight Gain**

A longitudinal study examining weight gain of freshmen students from the beginning to the end of their first year of college found that college freshmen gain weight at a much higher rate than that of average American adults (Holm-Denoma, Joiner, Vohs, & Heatherton, 2008). The actual weight gain during the first year of college averages about 3-5 pounds and varies by sex, with females gaining slightly more weight than men. Additionally, most of the weight was gained during the first semester of college, and was maintained throughout the first year (Holm-Denoma et al., 2008; Kasparek, Corwin, Valois, Sargent, & Morris, 2008). Although weight gain is more prevalent and immediate in freshmen students, significant amounts of weight gain are also seen during the succeeding years of college (Racette et al., 2005). When monitored from the beginning of freshmen year to the end of sophomore year, students gained an average of 9 pounds and BMI increased among 69% of the participants. Since the poor eating habits adopted during the first years of college are sustained throughout the following years of school, they may be maintained into adulthood as well.

When compared to national samples of young adults in the CARDIA study with observed weight gain rates of slightly less than 1 kg per year, 3-5 pounds of weight gain during freshman year as observed in previous studies of freshmen weight gain is substantial (Holm-Denoma et al., 2008; Kasparek et al., 2008; Lewis et al., 2000). Additionally, a
longitudinal study compared university freshman women to same-aged community women for rate of weight change, and university women were found to gain weight 36 times faster than community women during freshmen year (Hovell, Mewborn, Randle, & Fowler-Johnson, 1985). The increased rate of weight gain among freshmen can be attributed to a variety of reasons, including increased sedentary lifestyles and caloric intake (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008).

**Dietary Intake of College Students**

College provides most young adults with the first opportunity to be completely responsible for their own food choices. A large proportion of college students are uneducated about current dietary guidelines and demonstrate poor eating behaviors (Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007; Von Ah et al., 2004). Although messages promoting the health benefits of fruits and vegetables are frequently used, the majority of students eat fewer than five fruits and vegetables each day (American College Health Association, 2013; Huang et al., 2003; McCracken, Jiles, & Blank, 2003). Similarly, in a study of 738 college students, 67% reported not meeting the recommended minimum of 20 grams of dietary fiber per day (Huang et al., 2003). The Dietary Guidelines recommend that Americans eat a variety of fruits and vegetables in order to vary their intake of vitamins, nutrients and phytochemicals. If most college students are not meeting the minimum requirements for fruits and vegetable consumption, then they are likely to have diets deficient in essential vitamins and minerals as well.

Longitudinal research indicates that the transition from adolescence to adulthood is accompanied by an increase in fast food consumption and a decrease in breakfast consumption (Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). Because fast food meals are typically high in fat and calories, a positive association has been found between fast food consumption and increased calorie consumption and BMI (Rosenheck, 2008). Studies focused on college students, in particular, found that they consume fried or fast foods at least 3 times per week (Morse & Driskell, 2009; Racette et al., 2008), and another study determined that the average is 6-8 times per week (Driskell, Meckna, & Scales, 2006). Additionally, the National College Health Risk Behavior Survey found that 66% of college females exceed the recommended intake of saturated fat (Anding, Suminski, & Boss,
Sugary sweetened beverages are another source of empty calories contributing to college students’ poor eating behaviors. West et al. (2006) found that 65% of college students consume at least one sugary sweetened beverage daily, which calculated to an average 543 calories per day. Taken together, these unhealthy dietary habits, displayed by college students show a need for interventions that focus on improving eating habits of young adults.

There is limited research determining whether or not increased nutrition knowledge leads to positive eating behaviors. However, a cross sectional study that examined the relationship between current dietary guidelines and food choice by college students in the dining hall found that for fruit, dairy, protein, and whole grains, increased knowledge was related to better eating behaviors (Kolodinsky et al., 2007). Furthermore, students indicated nutrition knowledge as the main determinant of individual food choices in every case (Kolodinsky et al., 2007). While it is unknown whether nutrition education alone may be enough to significantly change eating behaviors, evidence shows that nutrition knowledge, specifically about current dietary guidelines, is an indicator of healthier food choices.

**2010 Dietary Guidelines for Americans**

The 2010 Dietary Guidelines are designed to help Americans choose diets that will meet nutrient requirements, promote health, support active lives and reduce risk of chronic disease (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010). Taken together, they encourage most Americans to eat fewer calories, be more active and make wiser food choices. The main recommendations are to: increase fruit and vegetable intake, eat a variety of vegetables, choose whole grain products and fat-free, low-fat dairy products and lean protein options, maintain a diet low in saturated fats, trans fats, cholesterol and sodium, and drink water instead of sugary drinks.

**MyPlate Guidelines**

In 2011, the United States Department of Agriculture switched from MyPyramid to MyPlate, a simpler and more user friendly version, in an effort to make it easier for Americans to choose healthy foods. MyPlate divides the plate into 4 different categories to represent the vegetable, fruit, grain and protein food groups, and dairy is represented by a cup on the side. According to MyPlate guidelines, a plate should be 30% vegetables, 30% grains,
20% fruits and 20% protein, accompanied by a serving (one cup) of dairy (U.S. Department of Agriculture, 2011). Additional messages like “make ½ your grains whole”, “vary your protein choices”, and “make ½ your plate fruits and vegetables” accompany the plate as well. Because the MyPlate campaign is new, there are no known interventions evaluating the effectiveness of including MyPlate in curriculum aimed at changing eating behaviors. This study will incorporate MyPlate guidelines and the 2010 Dietary Guidelines into the curriculum used during the nutrition workshops with the goal of increasing participants’ knowledge acquisition and personal agency towards eating healthy.

**Peer Health Education**

Peer health education is defined as “the teaching or sharing of health information, values and behaviors by members of similar age or status groups” (Sciacca, 1987, p. 5). It embraces the idea of students helping students in order to promote positive health beliefs and behaviors. Peer health education program designs vary, and are often tailored to best meet the needs of the specific population and utilize campus resources (Sloane & Zimmer, 1993). To ensure fidelity, peer health educators should be carefully trained and supervised (Newton & Ender, 2010).

Numerous peer education programs have been used in regards to improving behaviors of college students related to sexual health (Brigham et al., 2002; Ergene, Çök, Tümer, & Ünal, 2005; Sawyer, Pinciaro, & Bedwell, 1997), alcohol and drug usage (Bergen-Cico, Urtz, & Barreto, 2004; White, Park, Israel, & Cordero, 2009), and nutrition (Buller et al., 1999; Kunkel, Bell, & Luccia, 2001; White et al., 2009). Based on the evidence, the present study will use the peer health education model to deliver the nutrition workshops.

It is important that health educators use effective, evidence-based strategies when planning and creating programs. While peer health education is prevalent, there is a lack of research evaluating the effectiveness of the programs on the participants. Rather, more research has focused on the influence the mentoring experience has on the peer health educator, instead of any change experienced by the students that participate in the programs (Badura, Millard, Peluso, & Ortman, 2000; Harmon, 2006; Wawrzynski, LoConte, & Straker, 2011). Therefore, one purpose of this study is to expand the research related to understanding the role the peer health educator has in influencing participants’ behaviors.
The Health Promotion department at San Diego State University will use the results of this pilot study to tailor future health education programming.

**APPLICATIONS OF THE THEORY OF PLANNED BEHAVIOR**

While numerous studies have utilized the TPB, parts of the TPB or other constructs in addition to the TPB, the results are inconclusive. Many studies have used only the TPB in its entirety to predict health related behaviors (Bogers, Brug, Van Assema, & Dagnelie, 2004; Conner, Norman, & Bell, 2002; Fila & Smith, 2006; Kassem, Lee, Modeste, & Johnston; 2003; Verbeke & Vackier, 2005). Of the studies that have used the TPB in its entirety without adding in the moderating effect of other variables, the results vary. Kassem et al. (2003) examined the relationship between the TPB and female soft drink consumption. The data indicates that the intentions had statistically positive associations with behavior and the strongest predictor of intentions was attitude (Kassem et. al, 2003). Similarly, other studies have found a significant relationship between intentions and behavior (Bogers et al., 2004; Conner et al., 2002). However, some studies indicate that there is no association between intentions and behavior, and instead the other constructs of the theory have a direct relationship with behavior (Fila & Smith, 2006; Verbeke & Vackier, 2005). The variance in results is most likely due to the samples and specific health behavior studied.

Instead of only using the TPB to predict behaviors, studies have added constructs from other theories as additional variables. The following, though not exhaustive, list of variables have been used with the TPB: role identity, group norms and group identification (Åstrom & Rise, 2001), perceived need (Payne et al., 2004), social influence variables (Povey, Conner, Sparks, James, & Shepherd, 2000), and perceived risk (Blue, 2007). In all of the previously listed studies, the additional variables unrelated to the TPB did not have a stronger effect on predicting behavior than the TPB. According to Povey et al. (2000), social influence variables acted as moderator variables on the relationship between perceived behavioral control and intentions to eat healthy. Likewise, it was found that perceived need did not predict actual behavior, but perceived behavioral control and intention did (Payne et al., 2004). These findings conclude that when used in relation to other constructs, the TPB is still a strong predictor of behavior.
An examination of studies using the TPB to predict eating behaviors revealed that the majority are cross sectional designs (Armitage & Conner, 2006; Bogers et al., 2004; Conner et al., 2002; Kassem et al., 2003). Given that data for these studies was collected through questionnaires, it means that behavior change was not actually measured. Rather, intentions to perform the behavior were assessed. Thus, one cannot conclude if any behavior change actually occurred based on the predictions of the TPB. However, a small number of prospective studies, varying in follow up time, have been used to study the relationship between the TPB and future behavior change (Conner et al., 2002; Povey et al., 2000). After a six year longitudinal study assessing the TPB and healthy eating, Conner et al. (2002) found that healthy eating behavior was strongly predicted by intentions. Given these findings, it is imperative that interventions focus on follow up measures to better assess the relationship of the TPB and behavioral change. In the present study, a follow up survey was sent to participants one month after their involvement in the intervention, so that behavioral change could be measured.

Few studies have focused on the TPB and healthy eating in general. Instead, most of the research is focused on food specific behaviors such as vegetable and fruit (Bogers et al., 2004), reduction of fat intake (Paisley & Sparks, 1998), limiting sugary sweetened beverage (Kassem et al., 2003), and fish consumption (Verbeke & Vackier, 2005). When applying the TPB to a specific eating behavior, the research indicates that attitude is the strongest predictor of intention and subjective norm has little to no effect (Payne et al., 2004). Since this study is assessing the concept of eating healthy versus intake from a specific food group, the results will most likely be different than those presented in the previous studies.

**SELF-EFFICACY**

Self-efficacy, a construct from the social cognitive theory, is defined as an individual’s confidence in their ability to perform a behavior (Glanz et al., 2008). It is assumed that if people feel they are capable of performing a behavior, then they will most likely engage in the behavior. Interventions focused on improving participants’ self-efficacy have proven effective in changing healthy eating behaviors (Bebetsos, Chroni, & Theodorakis, 2002; Roach et al., 2003; Von Ah et al., 2004). A meta-regression of behavior and theory driven interventions assessed the effectiveness of the different components of
theories used and found that interventions focused on self-monitoring, including a self-efficacy component were most powerful in changing behaviors (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). Since the literature indicates that self-efficacy is a strong predictor of behavior change and maintaining healthy eating behaviors (Bebetsos et al., 2002), interventions should incorporate methods that improve participants’ self-efficacy.

APPLICATIONS OF THE INTEGRATED BEHAVIORAL MODEL

Though the Theory of Planned Behavior (TPB) has been used extensively in eating behavior studies, a thorough review of the literature revealed very few studies using the Integrated Behavioral Model (IBM) to predict behavior. Some research has combined the TPB with a construct from the IBM, such as self-efficacy (Fila & Smith, 2006) or subjective norm (Åstrom & Rise, 2001; Povey et al., 2000), to determine if those constructs are moderating variables. However, there is a limited amount of research solely using the IBM in its entirety. Kaspryzk, Montaño and Fishbein (1998) applied the IBM to predict condom use in high HIV risk groups, and a recent study used the model to study screening for colorectal cancer (Montaño, Selby, Somkin, Bhat, & Nadel, 2004). Furthermore, limited research was found using the IBM to predict eating behaviors, or measure other health related behaviors specifically related to college students. In order to assess whether the IBM can be effective in promoting positive health behavior change, the IBM drove the analysis of this study (See Figure 1).

Figure 1. Conceptual framework.
CHAPTER 3

METHODS

RECRUITMENT AND DESIGN OF INTERVENTION

The analyses were performed on data collected from the Nutrition Basics Workshop offered by the San Diego State University’s Health Promotion department of Student Health Services during the spring and fall semesters of 2013. During the spring semester, workshops were offered twice a week at the Activities and Recreation Center. Due to difficulty recruiting for workshops at this location, workshops were relocated to the Health Promotion department and the on-campus Residence Halls twice a week for the following fall semester. Health Promotion was chosen as a primary location for the workshops as students have been coming to Health Promotion for many years to seek nutrition education and SDSU has seen success with similar peer-run programming on HIV and women’s health exams. The Residence Halls were selected as a secondary location in order to bring the programming to students in their place of residence, attempting to cut down on the barrier of finding the programming and potentially increasing student access. Recruitment strategies included: distributing flyers to students at on-campus outreach and presentations given through the Health Promotion department, posting flyers around Student Health Services, publishing articles about the workshop in the online campus newspaper and blog, advertisement at the Activities and Recreation Center, and advertisement from Resident Hall Advisors to their assigned floors. SDSU peer health educators were recruited to facilitate the workshops. In order to qualify as a facilitator, peer health educators had to have completed a year within the program at SDSU and were required to attend an intensive training process. This consisted of interviews with the study investigator, three training sessions, a curriculum quiz in which they had to score at least 80%, and a mock workshop.

Students attended the workshops on a walk-in basis and there was no incentive for participation. At the beginning of the workshop, students were informed that participation in the study was voluntary and had no effect on future participation in peer health education workshops. Participants were informed that their responses would be anonymous and were
required to provide written, informed consent. They created an individual four digit identification code (date of birth + last two digits of cell phone number), so their identities would not be linked to their responses. This code was used to compare their responses on the pre-, post-, and follow-up surveys. Participants were asked to provide their email address on the informed consent if they were interested in receiving the online follow-up survey approximately one month after the intervention. An incentive was offered if participants returned the electronic follow-up survey. The curriculum for the workshop was based on the 2010 Dietary Guidelines for Americans, MyPlate, serving sizes, reading food labels, and the development of SMART goals.

Data were collected through self-report questionnaires. Pre- and post- surveys were administered at the workshop, and a follow-up survey was sent electronically one-month post class. The Integrated Behavioral Model was used to define the variables measured in this study. These included: knowledge, attitudes, personal agency, perceived norm, and intention. Individual level variables, including age, gender, ethnicity and year in school, were also measured. The main outcome of interest was a change in eating behaviors, which was assessed by the pre-and follow-up evaluations. San Diego State University’s Institutional Review Board approved the study.

POPULATION AND SAMPLE

There were 30 Nutrition Basics Workshops offered with an average of 2.11 attendees per session. Six workshops were offered during spring 2013, and the majority of the workshops (n=24) were carried out during the fall semester. The workshops were evenly split between Health Promotion (n=12) and the residence halls (n=12). However, 78% of the participants (n=51) attended workshops at the residence halls. Of the 65 students that attended the Nutrition Basics Workshop, there were 53 matching pre-/post-surveys available for analysis. The remaining participants (n=12) completed either the pre- or post-test, but did not complete both. These surveys were dropped from the analysis. The sample consisted of 33 female and 20 male undergraduate students 18-25 years old. The majority of the students (60.4%) were between 17-19 years old, 22.6% were 20-22 years old and 16.9% were 23-25 years old. Of the 53 participants that completed the pre- and post- evaluations administered at the intervention, 23% (n=12) also completed the online follow-up survey sent one month
after the workshop. Inclusion criteria required that the participant be a current San Diego State University undergraduate student, be 18-25 years of age and attend the peer health education nutrition workshop for the first time.

**TREATMENT**

The pre-, post-, and follow-up self-report questionnaires used previously validated measures in addition to measures developed specifically for this study. The pre-evaluation included measures related to demographics, knowledge, eating behaviors during the past month, perceived behavioral control, intentions, attitude, and perceived norm. The post-evaluation measured the same items except demographics and eating behaviors. The follow-up survey measured participants’ eating behaviors during the month following the intervention and knowledge. The pre-, post- and follow-up surveys are presented in the Appendix.

A direct measure of *knowledge acquisition* was obtained from 12 items that asked questions specific to the curriculum used in the intervention. There were 2 true or false, 1 fill in the blank, 1 yes or no, and 8 multiple-choice questions. Question content was directly related to the material presented in the workshop. An increase in correct responses from pre- to post-evaluation determined whether knowledge acquisition occurred, and maintenance of knowledge was determined by comparing the follow-up survey scores to the post-evaluation scores.

*Eating behaviors* during the last month were assessed by 8 items taken from the Fat- and Fiber-related Diet Behavior Questionnaire (Shannon et al., 1997). The measure consisted of subscales assessing how often a participant: replaced high-fat foods with fruits and vegetables (Cronbach’s $\alpha=0.50$), replaced high-fat meats with low-fat alternatives (Cronbach’s $\alpha=0.53$), ate fruits and vegetables (Cronbach’s $\alpha=0.56$), and substituted high-fiber for low-fiber foods (Cronbach’s $\alpha=0.51$) (see Table 1). Response categories were on a 5-point scale that ranged from 1= “never” to 5= “always”. For the purpose of this survey, eating *healthy* was defined as “around one third of what you eat each day should be fruit and vegetables, one third should be bread, potatoes, pasta and rice and one third should be split between milk and dairy products and meat, fish, pulses etc. Fatty foods (e.g. chips, crisps, and sugary foods e.g. cake, sweets) should be kept to a minimum” (Payne et al., 2004).
Table 1. Fat- and Fiber- Related Diet Behavior Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>“Never”</th>
<th>“Rarely”</th>
<th>“Sometimes”</th>
<th>“Usually”</th>
<th>“Always”</th>
<th>Prefer not to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat raw vegetables for a snack?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat a vegetable at lunch?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat whole-wheat bread instead of white bread?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat fruit for breakfast?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat a vegetarian dinner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose raw vegetables or fruit for snacks instead of chips?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat a fruit for dessert?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat whole grain pasta, rice or crackers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attitude towards eating healthily was measured by responding to the prompt “For me, eating healthily next week would be” on a 7-point scale from 1=very bad to 7=very good (Cronbach’s $\alpha=.74$) (Payne et al., 2004).

Perceived Norm consisted of two items that measured descriptive norm (Povey et al., 2000) and injunctive norm (Payne et al., 2004). Descriptive norm was measured by responses to the question “to what extent do people who are important to you eat a healthy diet?” (Cronbach’s $\alpha=.80$). Responses were measured on a 5-point scale from 1= “not at all” to 5= “to a very great extent”. Injunctive norm was measured by responses to the prompt “People who are important to me think that I should eat healthily next week” on a 7-point scale from 1=strongly disagree to 7=strongly agree. The mean scores of the two items determined a participant’s overall perceived norm.

Personal Agency was assessed by three items. One item derived from Smith (2011) measured self-efficacy (“I feel I will be good at eating healthily next week”) on a 7-point
scale from 1=strongly disagree to 7=strongly agree (Cronbach’s $\alpha=.69$). The other two items measured perceived control by asking participants to respond to the prompt “I am confident I can eat healthily next week” on a 7-point scale from 1=strongly disagree to 7=strongly agree (Cronbach’s $\alpha=.87$) and answer the question “how much control to you feel you have over whether you eat healthily next week?” on a 5-point scale from 1=no control to 5=complete control (Cronbach’s $\alpha=.87$) (Payne et al., 2004). Overall personal agency was measured by taking a mean of the three scores.

Intention to eat healthily consisted of two items adapted from Povey et al. (2000). Participants were asked to respond to the prompts “I intend to eat healthily next week” and “I want to eat healthily next week” on a 7-point scale from 1=strongly disagree to 7=strongly agree (Cronbach’s $\alpha=.89$). Intention was measured by taking a mean of the two scores.

**DATA ANALYSIS PROCEDURES**

Eating behavior change is the primary outcome of interest in this study and participation in the nutrition basics workshop is the exposure of interest. IBM SPSS Statistics Version 21.0 was used for all data analyses.

Descriptive statistics were used to describe the sample. Knowledge related questions were coded as 0 “wrong” or 1 “right” and the total number of correct answered were totaled for each participant. A one way repeated measures ANOVA was run to compare the mean correct answers from baseline to post-intervention. Due to the small sample size at follow-up, the non-parametric, matched-pairs signed-ranks test was used to compare any change in knowledge from post intervention to follow-up. One-way ANOVA’s were also run to detect any difference in means due to gender or age.

Paired sample t-tests were conducted to detect any significant change in participants’ perceived norms, attitudes, personal agency and/or intentions. Additionally, each variable was further split by gender to determine whether there was a significant difference between males and females. Pearson’s correlation tests were used to identify any relationships between perceived norms, attitudes, personal agency and intentions. Due to the small sample size at follow-up, it was not of statistical significance to determine whether intentions predicted behavior change.
Baseline and follow-up scores for eating behaviors were compared using Wilcoxon matched-pairs signed-ranks test for nonparametric variables. Eating behaviors were examined by age and gender to detect any influence of the variables on responses. Results were considered significant at $p \leq 0.05$. 
CHAPTER 4

RESULTS AND DISCUSSION

PRESENTATION OF THE FINDINGS

All participants were between 18-25 years old and students at San Diego State University. The majority of the sample (60.4%, n=32) were between 17-19 years old, 22.6% (n=12) of the participants were 20-22 years old, and the remaining 9% (n=9) were 23-25 years old (see Table 2). The sample consisted of more females (62.3%, n=33) than males (37.7%, n=20). The majority of the participants (47.2%, n=25) identified themselves as White, 17% (n=9) were Hispanic or Latino, 15.1% (n=8) were African American, 13.2% (n=7) identified as Asian or Pacific Islander and the remaining 7.5% (n=4) chose other. Half of the sample, 50% (n=26) were first year students ($M=2.21, SD=1.56$). Seventeen percent (n=9) were 2$^{nd}$ year students, 13.5% (n=7) 3$^{rd}$ year students, the remaining 19.5% (n=10) were 4+ year students.

Knowledge

Descriptive statistics (mean, median, mode and standard deviation) were calculated for knowledge at baseline, post-intervention and one-month follow-up (see Table 3).

Since the sample size at follow-up was small (n=12), separate analyses were conducted from baseline to post-intervention, post-intervention to follow-up and baseline to follow-up to detect any significant change in participants’ scores. A one-way repeated measures analysis of variance (ANOVA) was conducted to compare scores on knowledge at Time 1 (baseline) and Time 2 (post-intervention). There was a significant effect for time [Wilks’ Lambda=.168, $F(1,52)=257.36$, $p<.0005$, multivariate partial eta squared=.832]. A Wilcoxon Signed-ranks test indicated that the decrease in participants’ knowledge scores from post-intervention to follow-up was statistically significant ($Z=-2.284$, $p=.02$). While knowledge was not sustained from post to follow-up, a Wilcoxon Signed-ranks test indicated that knowledge at follow-up was significantly higher than knowledge at baseline ($Z=-3.064$, $p=.002$) (see Table 4).
Table 2. Demographics of Participants

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=53)</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>20</td>
<td>37.7%</td>
</tr>
<tr>
<td>Women</td>
<td>33</td>
<td>62.3%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-19 years old</td>
<td>32</td>
<td>60.4%</td>
</tr>
<tr>
<td>20-22 years old</td>
<td>12</td>
<td>22.6%</td>
</tr>
<tr>
<td>23-25 years old</td>
<td>9</td>
<td>9.0%</td>
</tr>
<tr>
<td>Year in school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>26</td>
<td>50%</td>
</tr>
<tr>
<td>2nd Year</td>
<td>9</td>
<td>17%</td>
</tr>
<tr>
<td>3rd Year</td>
<td>7</td>
<td>13.5%</td>
</tr>
<tr>
<td>4th + Year</td>
<td>10</td>
<td>19.5%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>25</td>
<td>47.2%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>9</td>
<td>17.0%</td>
</tr>
<tr>
<td>African American</td>
<td>7</td>
<td>13.2%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>7</td>
<td>13.2%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

Table 3. Descriptive Statistics for Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n=53)</th>
<th>Post (n=53)</th>
<th>Follow-Up (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>45.28</td>
<td>84.02</td>
<td>77.06</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>15.29</td>
<td>15.19</td>
<td>9.48</td>
</tr>
</tbody>
</table>

Table 4. Wilcoxon Signed Ranks Test

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-Up – Baseline Knowledge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Ranks</td>
<td>0a</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>12b</td>
<td>6.50</td>
<td>78.00</td>
</tr>
<tr>
<td>Ties</td>
<td>0c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (a) Follow-Up Knowledge < Baseline Knowledge; (b) Follow-Up Knowledge > Baseline Knowledge; (c) Follow-Up Knowledge = Baseline Knowledge
A one-way ANOVA was conducted to determine the impact of age on knowledge scores at baseline, post-intervention and one month follow-up. Subjects were divided into three groups according to their age (Group 1: 17 to 19; Group 2: 20 to 22; Group 3: 23-25). The mean scores were higher for participants in Group 3 at each point in time (see Table 5), but there was not a statistically significant difference at the p<.05 level in knowledge scores for the three age groups. There were also no statistically significant differences for knowledge based on gender at baseline, post-intervention or follow-up (see Table 6).

**Table 5. Descriptive Statistics by Age**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-19 years (n=32)</td>
<td>44.79</td>
<td>15.95</td>
</tr>
<tr>
<td>20-22 years (n=12)</td>
<td>44.45</td>
<td>12.97</td>
</tr>
<tr>
<td>23-25 years (n=9)</td>
<td>48.16</td>
<td>17.07</td>
</tr>
<tr>
<td>Total (n=53)</td>
<td>45.28</td>
<td>15.29</td>
</tr>
<tr>
<td>Post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-19 years (n=32)</td>
<td>82.39</td>
<td>17.36</td>
</tr>
<tr>
<td>20-22 years (n=12)</td>
<td>86.10</td>
<td>11.98</td>
</tr>
<tr>
<td>23-25 years (n=9)</td>
<td>87.04</td>
<td>10.31</td>
</tr>
<tr>
<td>Total (n=53)</td>
<td>84.02</td>
<td>15.19</td>
</tr>
<tr>
<td>Follow-Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-19 years (n=5)</td>
<td>75.00</td>
<td>13.19</td>
</tr>
<tr>
<td>20-22 years (n=3)</td>
<td>77.77</td>
<td>9.58</td>
</tr>
<tr>
<td>23-25 years (n=4)</td>
<td>79.15</td>
<td>4.79</td>
</tr>
<tr>
<td>Total (n=12)</td>
<td>77.08</td>
<td>9.48</td>
</tr>
</tbody>
</table>

**Table 6. ANOVA of Knowledge**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Knowledge</td>
<td>Between Groups</td>
<td>90.35</td>
<td>2</td>
<td>45.17</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>12069.72</td>
<td>50</td>
<td>241.39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>12160.07</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Knowledge</td>
<td>Between Groups</td>
<td>219.52</td>
<td>2</td>
<td>109.76</td>
<td>.47</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>11772.16</td>
<td>50</td>
<td>235.44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11991.68</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow-Up Knowledge</td>
<td>Between Groups</td>
<td>40.19</td>
<td>2</td>
<td>20.09</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>948.16</td>
<td>9</td>
<td>105.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>988.34</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Perceived Norms

A paired sample t-test was conducted to evaluate the impact of the intervention on participants’ total perceived norm. There was a statistically significant increase in perceived norms from Time 1 ($M=3.52, SD=.71$) to Time 2 [$M=3.79, SD=.72, t(50)=-2.98, p=.004$]. When split by gender, females showed a statistically significant change in norms from Time 1 ($M=3.47, SD=.75$) to Time 2 [$M=3.77, SD=.76, t(31)=-2.46, p=.020$]. There was not a significant difference in perceived norms for males from Time 1 to Time 2.

Personal Agency

A paired sample t-test indicated that there was a statistically significant increase in personal agency from Time 1 ($M=4.01, SD=.75$) to Time 2 [$M=4.33, SD=.59, t(50)=-4.12, p<.005$]. When split by gender, males and females both showed a significant increase in personal agency from Time 1 to Time 2 (see Table 7).

<table>
<thead>
<tr>
<th>Table 7. Paired T-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paired Differences</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
</tbody>
</table>

Note: *Significant at the p<.05 level.

Attitude

There was not a statistically significant change in attitude from Time 1 ($M=6.12, SD=1.10$) to Time 2 [$M=6.25, SD=.93, t(50)=-1.26, p=.212$].

Intentions

There was a statistically significant increase in intentions from Time 1 ($M=6.07, SD=1.02$) to Time 2 [$M=6.30, SD=.83, t(51)=-2.43, p=.019$]. When split by gender, males showed a statistically significant change in intentions from Time 1 ($M=5.92, SD=1.25$) to
Time 2 \([M=6.28, SD=.94, t(19)=-2.21, p=.040]\). Females did not show a significant difference in intentions from Time 1 to Time 2.

**Correlations**

The relationships between perceived norms, personal agency, attitude and intentions were investigated using Pearson product-moment correlation coefficient. There were strong, positive correlations between personal agency and intentions and personal agency and attitude (see Table 8).

**Table 8. Pearson Correlations of Constructs at Baseline**

<table>
<thead>
<tr>
<th></th>
<th>Baseline Norms (n=51)</th>
<th>Baseline Personal Agency (n=51)</th>
<th>Baseline Intentions (n=52)</th>
<th>Baseline Attitude (n=52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Norms</td>
<td>1</td>
<td>.352</td>
<td>.265</td>
<td>.125</td>
</tr>
<tr>
<td>Baseline Personal Agency</td>
<td>.352</td>
<td>1</td>
<td>.788*</td>
<td>.641*</td>
</tr>
<tr>
<td>Baseline Intentions</td>
<td>.265</td>
<td>.788*</td>
<td>1</td>
<td>.545*</td>
</tr>
<tr>
<td>Baseline Attitude</td>
<td>.125</td>
<td>.641*</td>
<td>.545*</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: *Correlation is significant at the 0.01 level (2-tailed).

**Eating Behaviors**

Descriptive statistics and frequencies for participants’ eating behaviors at baseline and one month follow-up are presented in Tables 9 and 10. Eating behavior measures were analyzed individually to assess whether a difference was unique to the behavior itself. Mean scores for females were higher than males for all eating behavior measures. A one-way ANOVA indicated that gender has an impact on most of the eating behaviors at baseline at the p<.05 significance level (see Table 11).

A Wilcoxon ranked-sign test was conducted for each behavior to determine if there was a statistical difference between eating behaviors at baseline and follow-up. There was a statistically significant increase in the number of participants that chose to eat fruit for breakfast \((Z=-2.049, p=.04)\) and ate a vegetarian dinner in the last month \((Z=-2.121, p=.034)\).
Table 9. Descriptive Statistics for Eating Behaviors at Baseline

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean</th>
<th>SD</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat raw vegetables as a snack n=52</td>
<td>2.94</td>
<td>1.09</td>
<td>9.6%</td>
<td>25.0%</td>
<td>34.6%</td>
<td>23.1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Eat a vegetable at lunch n=51</td>
<td>3.35</td>
<td>1.16</td>
<td>5.9%</td>
<td>17.6%</td>
<td>31.4%</td>
<td>25.5%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Eat whole wheat bread instead of white bread n=52</td>
<td>3.79</td>
<td>1.33</td>
<td>9.6%</td>
<td>7.7%</td>
<td>17.3%</td>
<td>26.9%</td>
<td>38.4%</td>
</tr>
<tr>
<td>Eat fruit for breakfast n=52</td>
<td>3.29</td>
<td>1.21</td>
<td>11.5%</td>
<td>9.6%</td>
<td>34.6%</td>
<td>26.9%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Eat a vegetarian dinner n=50</td>
<td>2.38</td>
<td>1.18</td>
<td>26.0%</td>
<td>32.0%</td>
<td>28.0%</td>
<td>6.0%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Choose raw vegetables instead of chips n=52</td>
<td>3.33</td>
<td>1.08</td>
<td>5.8%</td>
<td>15.4%</td>
<td>32.7%</td>
<td>32.7%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Eat fruit for dessert n=52</td>
<td>3.15</td>
<td>0.94</td>
<td>3.8%</td>
<td>19.2%</td>
<td>40.4%</td>
<td>30.8%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Eat whole grain pasta, rice or crackers n=52</td>
<td>3.23</td>
<td>1.20</td>
<td>11.5%</td>
<td>11.5%</td>
<td>34.6%</td>
<td>26.9%</td>
<td>15.4%</td>
</tr>
</tbody>
</table>

Table 10. Descriptive Statistics for Eating Behaviors at Follow-Up

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean</th>
<th>SD</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat raw vegetables as a snack n=12</td>
<td>3.42</td>
<td>1.08</td>
<td>8.3%</td>
<td>8.3%</td>
<td>25.0%</td>
<td>50.0%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Eat a vegetable at lunch n=12</td>
<td>3.75</td>
<td>1.14</td>
<td>8.3%</td>
<td>0%</td>
<td>25.0%</td>
<td>47.7%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Eat whole wheat bread instead of white bread n=12</td>
<td>4.33</td>
<td>1.16</td>
<td>8.3%</td>
<td>0%</td>
<td>0%</td>
<td>33.3%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Eat fruit for breakfast n=12</td>
<td>3.92</td>
<td>1.17</td>
<td>8.3%</td>
<td>0%</td>
<td>16.7%</td>
<td>41.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Eat a vegetarian dinner n=12</td>
<td>3.33</td>
<td>1.23</td>
<td>0%</td>
<td>33.3%</td>
<td>25.0%</td>
<td>16.7%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Choose raw vegetables instead of chips n=12</td>
<td>3.92</td>
<td>1.17</td>
<td>8.3%</td>
<td>0%</td>
<td>16.7%</td>
<td>41.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Eat fruit for dessert n=12</td>
<td>3.08</td>
<td>1.08</td>
<td>8.3%</td>
<td>16.7%</td>
<td>41.7%</td>
<td>25.0%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Eat whole grain pasta, rice or crackers n=12</td>
<td>3.58</td>
<td>1.08</td>
<td>8.3%</td>
<td>0%</td>
<td>33.3%</td>
<td>41.7%</td>
<td>16.7%</td>
</tr>
</tbody>
</table>
Table 11. Eating Behaviors at Baseline ANOVA by Gender

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat raw vegetables as a snack</td>
<td>15.58</td>
<td>1</td>
<td>.905</td>
<td>17.21</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Eat a vegetable at lunch</td>
<td>8.32</td>
<td>1</td>
<td>1.21</td>
<td>6.87</td>
<td>.012*</td>
</tr>
<tr>
<td>Eat whole wheat bread instead of white</td>
<td>1.85</td>
<td>1</td>
<td>1.78</td>
<td>1.04</td>
<td>.313</td>
</tr>
<tr>
<td>Eat fruit for breakfast</td>
<td>15.40</td>
<td>1</td>
<td>1.19</td>
<td>12.99</td>
<td>.001*</td>
</tr>
<tr>
<td>Eat a vegetarian dinner</td>
<td>8.87</td>
<td>1</td>
<td>1.23</td>
<td>7.22</td>
<td>.010*</td>
</tr>
<tr>
<td>Choose raw vegetables or fruit instead of chips</td>
<td>9.02</td>
<td>1</td>
<td>1.01</td>
<td>8.95</td>
<td>.004*</td>
</tr>
<tr>
<td>Eat fruit for dessert</td>
<td>13.89</td>
<td>1</td>
<td>.618</td>
<td>22.50</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Eat whole grain pasta, rice or crackers</td>
<td>.212</td>
<td>1</td>
<td>.145</td>
<td>.705</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Significant at the .05 level.

**DISCUSSION OF THE FINDINGS**

The purpose of this pilot study was to assess the effectiveness of a healthy eating intervention on college students. Due to the increased overweight and obesity rates in the past decade, colleges nationwide are examining the use of nutrition interventions to improve college students’ health. A variety of methods including but not limited to, semester long nutrition courses (Ha & Caine-Bish, 2009; Matvienko, Lewis, & Schafer, 2001), online interventions (Franko et al., 2008; Gow et al., 2010), age and gender specific programs (Butler et al., 2004; Davy, Benes, & Driskell, 2006), and athlete specific programs (Abood et al., 2004) have been implemented to increase healthy eating behaviors among the college population. The current study’s findings were based off of a single exposure to a nutrition education workshop led by highly trained peer health educators. The primary outcome
desired was a positive change in eating behaviors. Additionally, knowledge acquisition, perceived norms, attitude, personal agency and intentions to eat healthy were also measured. It was hypothesized that participants’ eating behaviors would improve from baseline to one month follow-up. It was also anticipated that participants would show higher levels of nutrition related knowledge at post-intervention and follow-up than at baseline. Finally, it was expected that there would be a significant positive change in participants’ attitudes towards healthy eating, perceived norms of healthy eating and personal agency to eat healthy.

Analyses of the data revealed that participants had a statistically significant positive increase for two of the eating behaviors measured: eating fruit for breakfast and eating a vegetarian dinner. While the mean values for the remaining behaviors did increase from baseline to follow-up, the mean difference was not significantly different. Although, the findings are not necessarily generalizable due to the small sample of participants who completed the follow-up survey, it is encouraging that some long-term changes were seen. Additionally, as short-term behavior change in both knowledge and intentions were statistically significant, this may indicate the usefulness of targeted short-term programming that educates students at periods of higher-risk, for example holiday eating, residence hall move-in weeks, and at the beginning of each school year when students are returning to making food choices independently. In future programming, it may also be worthwhile to focus on one particular eating behavior, such as increasing fruit and vegetable consumption. Studies show that fruit and vegetable consumption is associated with a decreased risk for chronic diseases (Bazzano et al., 2002; Liu et al., 2000) and national data indicates that 93.7% of young adults aged 18-24 years old do not meet the dietary guidelines for five servings fruit and vegetables per day (American College Health Association, 2013). Similar interventions whose main outcome was an increase in students’ fruit and vegetable consumption were effective in significantly increasing participants’ fruit and vegetable intake (Ha & Caine-Bish, 2009; Richards, Kattelmann, & Ren, 2006). Therefore, focusing on a single eating behavior may be easier for people to integrate into their life and the benefits of consuming fruits and vegetables are supported by medicine.

Female participants reported healthier eating behaviors at baseline and follow-up when compared to male participants. This finding is supported by research comparing gender differences in health behaviors, specifically food and diet related. Females are more likely
than males to report avoiding high-fat foods, eating more fruits and vegetables, and limiting sodium intake (Wardle et al., 2004; Westenhoefer, 2005). A study examined the causal mechanisms that may explain these gender differences in 23 countries and found that females’ greater weight control involvement and stronger beliefs in healthy eating significantly attributed to their likelihood to report healthier eating behaviors in nearly all the countries (Wardle et al., 2004). Another cross-sectional study of college students found that females also indicated experimenting with diets significantly more frequently than men, believed there was too much carbohydrates and sugar in their diet, and sought nutrition information from magazines and family (Davy et al., 2006). Nonetheless, it is important to note that more issues of muscle dysmorphia and disordered eating have been recently cited in the male population (Dakanalis & Riva, 2013; Strother, Lemberg, Stanford, & Turberville, 2012). It is likely that this increase of eating disorder related issues in males can be linked to messages portrayed by the media encouraging males to desire a muscular physique (Gough, 2006, 2007). This program shows that findings are consistent with those found in larger populations and substantiates SDSU’s need for male-focused program or marketing of the program specifically targeted at males. Perhaps incentives could be used to encourage male participation as their existing behaviors appear to require an increased change to meet the Healthy Campus 2020 recommendations.

The literature suggests that differences between male and female eating behaviors begin in adolescence as a result of body dissatisfaction (Ata, Ludden, & Lally, 2007). Females desire to decrease their overall body size, but males usually want to increase the size of their upper body (Ata et al., 2007). When assessing these differences from an ecological perspective, it is likely that an individual’s environment creates socially prescribed body types, eating styles and motivations based on gender (Conner, Johnson, & Grogan, 2004). In a longitudinal study of adolescent high school girls, dietary restraint was directly related to body dissatisfaction and sociocultural influences. Girls with the most body dissatisfaction were more likely to be surrounded by a culture that supported a thin ideal and encouraged dieting (Dunkley, Wertheim, & Paxton, 2001). In contrast, cultural ideals of male appearance encourage a muscular and strong physique (Frederick, Buchanan, et al., 2007; Frederick, Forbes, Grigorian, & Jarcho, 2007).
Consequently, in a focus group assessing effective and ineffective aspects of nutrition education interventions, males wanted a larger emphasis placed on weight gain or muscle gain (Kicklighter, Koonce, Rosenbloom, & Commander, 2010). These societal norms that lead to body dissatisfaction influence eating behaviors and account for some of the differences seen between male’s and female’s interest in nutrition and this is an important factor in current and future program design. Knowing this information is critical to creating and implementing a program that does not exacerbate this problem, but rather encourages independent choice and skill building to allow participants to make healthier eating choices rather than restrict. This pilot program does not promote skill building to increase body mass, but rather to increase nutritional intake. The study’s findings of women entering with healthier baseline eating habits suggests this is necessary and body image issues are a sensitive problem that may exist and should not be exacerbated.

Males and females also differ in reasoning behind food choices. Males are more likely to make a choice based on taste preference and convenience (Gough & Conner, 2006; Levi, Chan, & Pence, 2006). Females are more like to consider health and weight management when making a food choice (Levi et al., 2006). Therefore, curriculum used in workshops needs to appeal to both genders’ reasoning for choosing food. If eating healthy is convenient and tastes good, then males may be more likely to change their eating behaviors. Another strategy includes creating a more masculine image associated with healthier food choices. Females would benefit from information providing the health benefits of certain foods. However, given the high rates of body dissatisfaction in females, it is suggested that workshops do not discuss weight management in relationship to food choices. Furthermore, it is essential that health promotion professionals take into account the gender differences between how males and females relate to and identify with health behaviors in future nutrition programming.

Participants’ knowledge significantly increased post intervention and remained higher than baseline at follow-up. There was a decrease in knowledge from post intervention to follow-up; however, the mean difference between knowledge at baseline and follow-up was statistically significant. The findings should be interpreted with caution given the small sample size at follow-up. Knowledge and skills was added as a construct to the Integrated Behavior Model as a direct influence of an individual’s behavior (Glanz et al., 2008).
Although only two eating behaviors changed, eating a vegetarian dinner and eating a fruit with breakfast, these results are encouraging and support this relationship. It may be that an increase in knowledge served as a behavioral cue to support short term behavior change. These results are consistent with research findings indicating that higher nutrition related knowledge, specifically in regards to reading food labels, predicts healthier food choices (Graham & Laska, 2012). While the single session workshop was effective in increasing participants’ knowledge and changing a portion of the eating behaviors of interest, it is recommended that future programming use a series of workshops if a wider range of eating behavior change is the desired outcome.

There was a statistically significant change in perceived norms from baseline to post-intervention. When split by gender, females experienced a more significant change in norms than males. In fact, there was no significant change in norms for males pre- and post-intervention. The IBM includes injunctive and descriptive norms. Injunctive norm refers to normative beliefs about other people’s expectation for that individual to engage in the given behavior. Descriptive norms refer to normative beliefs about other’s behaviors. Similar to gender differences in self-report of eating behaviors, research shows that females report stronger beliefs regarding perceived norms (Levi et al., 2006). Given that females reported receiving more information about nutrition from friends and family (Davy et al., 2006), they may feel that those people eat healthy and also expect them to practice healthy behaviors. Conversely, the masculinity complex explains why males may not believe that their peers expect them to maintain a healthy diet (Levant & Wimer, 2014; Mahalik, Burns, & Syzdek, 2007). In a study exploring the relationship between genders and eating habits, results indicated that male’s food choices are strongly related to the ideology of gender roles in the American society (Levi et al., 2006). Therefore, health promotion programs specifically targeted at breaking down the barrier of gender roles related to health behaviors may be more successful in changing male’s eating behaviors. Given the results of this pilot program, the curriculum will be edited to align with this recommendation.

Perceived norms did not have a correlation with attitude, personal agency or intentions. In fact, it was the only construct that participants did not show a correlation with any of the other variables. Only two of the studies that examined eating behaviors found that norms significantly influenced the likelihood of participants adopting healthier eating
behaviors (Åström & Rise, 2001; Louis, Davies, Smith, & Terry, 2007). When studying college students’ health behaviors, research has indicated that norms are a much stronger indicator of alcohol and drug use, rather than eating behaviors (Perkins, Haines, & Rice, 2005). Although this is a construct of IBM and a predictor in behavior change, based the findings of these studies constructs and measures other than perceived norms were more critical to the goals of this program.

As hypothesized, there was a significant change in personal agency post intervention. The change was significant in males and females, but there was a larger increase in the mean difference among males. According to the IBM, an increase in personal agency should result in an increase in intentions to change behavior, with the end result being a change in behavior (Glanz et al., 2008). Results from the present study support literature indicating that increasing self-efficacy is an effective and simple behavior change strategy (Brown, Wengreen, Vitale, & Anderson, 2011; Greene et al., 2012). Results showed that personal agency was positively correlated with intentions. Personal agency also had a strong positive correlation with attitudes. It appears that once participants felt more confident in their ability to eat healthy, their attitude about healthy eating increased. These results support the use of the curriculum focusing on SMART goal setting, teaching participants how to effectively read food labels and simple ways to eat a balanced diet, like following MyPlate guidelines.

Attitudes did not show any significant change post intervention. The mean score for attitude was fairly high at baseline, so participants may already have had a positive attitude towards healthy eating. Considering participants willingly participated in this intervention without any incentive, it is likely that they already had an interest in healthy eating or believed it was beneficial to seek nutrition education.

Results indicated that attitude had a strong positive correlation with intention. These results are consistent with previous research examining the relationship between attitudes, intentions and behavior change (Brug, de Vet, de Nooijer, & Verplanken, 2006; Louis et al., 2007). Generally, if people have a positive attitude about a behavior, it is likely that they will be more inclined to adopt the behavior. If there had been a larger sample size at follow-up, it would have been possible to explore this relationship further.

Although the small sample size at follow-up limited the analysis of the data, there were still noteworthy results to support the use of the peer led nutrition intervention. While
the outcome measure, eating behavior change, did not significantly change for each individual behavior measured, participants did increase the number of vegetarian meals consumed and more participants ate fruit at breakfast. Research shows that following a healthy diet, specifically consuming recommended levels of fruits and vegetables, is associated with reduced risk for negative health effects (Dauchet, Amouyel, Hercberg, & Dallongeville, 2006) and long term weight management (Rolls, Ello-Martin, & Tohill, 2004; te Velde, Twisk, & Brug, 2007). Therefore, if participants are consuming more fruits and vegetables in addition to increasing their personal agency and intentions to eat healthy after the intervention, programs focusing on promoting health protective behaviors should continue to be implemented and would likely result in further behavior change.
CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

As the rates of overweight and obese young adults increased during the last decade (Ogden et al., 2006), this has become an area of attention for health promotion in higher education as substantiated by the Healthy Campus 2020 goals. While interventions related to alcohol, drugs and sexual behaviors have been widely tested in the college population, health promotion efforts specifically targeting healthy eating behaviors are less prevalent. However, if college students are provided the knowledge and skills to adopt healthier eating behaviors, the risk factors for them developing chronic health conditions, such as diabetes and hypertension, may decrease. Therefore, the purpose of this pilot study was to explore the effectiveness of a peer led nutrition workshop on a sample of college students at SDSU.

The Integrated Behavioral Model (IBM) served as the theoretical framework for this intervention. Only one study was found that used the IBM to predict eating behavior change, and that study targeted adolescents (Pelletier, Laska, Neumark-Sztainer, & Story, 2013). Therefore, in addition to evaluating the peer health nutrition programming, it was of interest to explore the relationship between the IBM and healthy eating behaviors among the college age population.

Results from the pilot study demonstrated that there were significant changes in participants’ scores on knowledge, personal agency, perceived norms, intentions, and some eating behaviors post-intervention and at one month follow-up. Consistent with the hypotheses, participants demonstrated an increase in knowledge of healthy eating skills from baseline to follow-up, there were significant improvements in some eating behaviors one month later, and personal agency was increased post intervention. Age did not influence participants’ scores, but gender correlated with norms, personal agency, and intentions.

As with all research, the present study had limitations. Given limited time and funding, there was no control group used for comparison. Based on results from other studies
with a similar research design and results, it is assumed that despite a small sample size, the programming did have an impact in some of the measures examined (Ha & Caine-Bish, 2009; Rose, Hosig, Davy, Serrano, & Davis, 2007).

Incentives were offered for returning the follow-up survey electronically, yet the response rate was still low. According to research examining methods to improve response quality and rates of electronic surveys, incentives based on prize draws were not effective (Sánchez-Fernández, Muñoz-Leiva, & Montoro-Ríos, 2012). Given the limited funding, a raffle prize drawing was the only option for the present study. According to recent research, personalized messages in addition to a lower number of reminders is the most effective method to increase response rates (Sánchez-Fernández et al., 2012). For future programming, it is recommended that personalized messages are sent to each participant.

Due to the small sample size, conclusions about eating behavior change or knowledge maintenance cannot be generalized to the larger population. Therefore, it is critical to engage a larger number of students in future programming and evaluation efforts. Additionally, it would be recommended that evidence-based strategies for follow-up survey participation be used in accordance with the above mentioned techniques.

As most of the participants attended the nutrition workshop at the residence halls, the majority of the participants were 17-19 year old, first year students. By offering the workshops at the residence halls, the barrier of access was removed. Therefore, in future programming it may be of interest to bring workshops directly to other students groups (Greek organizations, commuter resource centers, club meetings, etc.), rather than expecting students to seek out the workshop location at the health center. This may increase the participation rate and yield more representative results of the sample population.

There was likely some selection bias, given the method of recruiting participants. Students voluntarily attended the workshop without an incentive, so it is likely they already had some interest in healthy eating. Randomly selected participants may have been less willing to participate and learn in the workshop. Based on results from previous workshops offered by Health Promotion, we anticipated students to self-select and expected the results to demonstrate this. The high indications of perceived norms, attitudes, personal agency and intentions at baseline make it seem that there was likely self-selection bias in the study. If able to recruit students not actively engaged in thinking about or partaking in healthier eating
behaviors, it is anticipated that the program would have a greater impact on constructs examined.

The method of that eating behavior data was collected makes it possible that there were self-report issues. Participants were asked to recall their eating behaviors during the last week and reported them on a Likert scale. A 24-hour food recall may have been more effective, but not ideal for the study design. Results show that participants reported healthier eating behaviors than the investigators expected, which may be due to the self-report and self-selection nature of the study. Although “eat healthy” was defined on the pre- and post-test, participants may have interpreted the term differently based on their own beliefs.

Another limitation is the possibility of learning effect from the repeated administration of the measures. The questions were asked in the same order on all three assessment tools, so participants may have recognized the questions or knew what to expect. This could have resulted in an over estimation of the results. However, participants did still indicate significantly higher knowledge scores at follow-up than baseline. It is likely that a testing bias did not occur one month after the intervention, so the higher knowledge scores can be attributed as an effect of intervention. Additionally, methodological issues may have occurred with the scales used to measure perceived norm, personal agency, attitude, and intentions. Scales were previously validated, but instrument bias may have resulted from the manner the measures were presented to the participants. Testing bias could have been avoided by rewording and reordering the survey questions.

Although the peer health educators were required to complete an intensive training process to facilitate the nutrition workshops, there were likely some fidelity issues. Throughout the intervention, five different peer health educators facilitated the workshops individually or as a pair. Detailed scripts were provided to ensure that the same information was administered to every participant, but it was not possible to measure the adherence to the curriculum at every workshop. However, process evaluations occurred consistently throughout the intervention and appropriate changes were made to the curriculum based on feedback from the facilitators and participants. Facilitators were also evaluated by the participants for their quality of delivery. Another facilitation issue occurred with the collection of the pre- and post-tests. The workshop was scheduled for one hour. In some cases, students left early and did not take the post-test. Therefore, their results could not be
included in the analysis. In future programming, it is essential that facilitators emphasize the importance of obtaining both the pre- and post-tests from all participants. Considering the above limitations, the results of this pilot program were encouraging and Health Promotion will use the results to tailor future programming to make the workshops more effective and appealing to the SDSU population.
REFERENCES


APPENDIX

SURVEY INSTRUMENTS
Nutrition Basics Pre Evaluation

Please create an identification code. Use the day you were born (01-31) + the last 2 digits of your cell phone number. For example, Andy was born on the 8th and his cell phone number is 123-4567, so his code would be 08-67.

Identification Code: _______ _______ - _______ _______
(Birth Date) (Last 2 digits of cell phone #)

1. Please select your gender:
   a. Male
   b. Female
   c. Prefer not to answer

2. Please select your age:
   a. 17-19
   b. 20-22
   c. 23-25
   d. 26+
   e. Prefer not to answer

3. Please select your year in school:
   a. 1st year
   b. 2nd year
   c. 3rd year
   d. 4th year
   e. 5+ year
   f. Prefer not to answer

4. Please select your ethnicity:
   a. White
   b. Hispanic or Latino
   c. Black or African American
   d. Native American or American Indian
   e. Asian / Pacific Islander
   f. Other
   g. Prefer not to answer

Please answer the following questions to the best of your ability:

5. How many calories does fat provide per 1 gram?
   a. 6 cals/gm
b. 7 cals/gm  
c. 8 cals/gm  
d. 9 cals/gm

6. How many calories does alcohol provide per 1 gram?  
a. 5 cals/gm  
b. 6 cals/gm  
c. 7 cals/gm  
d. 8 cals/gm

7. Have you heard of MyPlate? (circle one)  
Yes   No

8. According to MyPlate guidelines, what portion of a plate should be filled with fruits and vegetables?  
a. 1/4  
b. 1/3  
c. 1/2  
d. 3/4

9. According to MyPlate guidelines, at least ____ of the grains you eat should be whole grains.  
a. ¼  
b. ½  
c. ¾  
d. All

10. A 2 tablespoon serving of peanut butter is the same size as a:  
a. Golf ball  
b. Ice cube  
c. 2 stacked dice

11. Which of the following is NOT one of the Recommended Dietary Guidelines for Americans:  
a. Choose fat-free or low-fat dairy products.  
b. Maintain a diet low in saturated fats, trans fats, cholesterol and salt.  
c. Avoid packaged and prepared foods.  
d. Increase our fruit and vegetable intake.

12. How many cups of fruit should men and women 19-30 years old consume per day?  
a. 1  
b. 2  
c. 3  
d. 4

13. A 1 ounce serving of cheese is the size of:  
a. 2 ping pong balls
b. An ice cube
c. 2 stacked dice

14. True or False (*Circle one*): Unbleached enriched wheat bread is whole grain.

15. True or False (*Circle one*) Regardless of where they come from, the calories you eat are either converted to physical energy or stored in your body as fat.

16. Fill in the blanks. When reading a food label, any percent daily value under ___ % is considered *low* and anything over ___ % is considered *high*.

Please answer the next question based on your eating behaviors during the last month. Check the box that best matches your answer.

In the past month how often did you…

<table>
<thead>
<tr>
<th></th>
<th>“Never”</th>
<th>“Rarely”</th>
<th>“Sometimes”</th>
<th>“Usually”</th>
<th>“Always”</th>
<th>Prefer not to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat raw vegetables for a snack?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat a vegetable at lunch?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eat whole-wheat bread instead of white bread?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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Please check the box that best matches your answer.
For the purpose of this survey, *eating healthily* means that ‘around one third of what you eat each day should be fruit and vegetables, one third should be bread, potatoes, pasta and rice and one third should be split between milk and dairy products and meat, fish, pulses etc. Fatty foods (e.g. chips, crisps, and sugary foods e.g. cake, sweets should be kept to a minimum.)’

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<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
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<td>People who are important to me think that I should eat healthily next week.</td>
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<td>I am confident that I can eat healthily next week.</td>
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Nutrition Basics Post-Evaluation

Please create an identification code. Use the day you were born (01-31) + the last 2 digits of your cell phone number. For example, Andy was born on the 8th and his cell phone number is 123-4567, so his code would be **08-67**.

Identification Code: _____ _____ - _____ _____
(Birth Date) (Last 2 digits of cell phone #)

Please answer the following questions to the best of your ability:

1. How many calories does fat provide per 1 gram?
   a. 6 cals/gm
   b. 7 cals/gm
   c. 8 cals/gm
   d. 9 cals/gm

2. How many calories does alcohol provide per 1 gram?
   a. 5 cals/gm
   b. 6 cals/gm
   c. 7 cals/gm
   d. 8 cals/gm

3. Have you heard of MyPlate? (circle one) Yes No

4. According to MyPlate guidelines, what portion of a plate should be filled with fruits and vegetables?
   a. 1/4
   b. 1/3
   c. 1/2
   d. 3/4

5. According to MyPlate guidelines, at least ____ of the grains you eat should be whole grains.
   a. ¼
   b. ½
   c. ¾
   d. All

6. A 2 tablespoon serving of peanut butter is the same size as a:
   a. Golf ball
   b. Ice cube
   c. 2 stacked dice
7. Which of the following is NOT one of the Recommended Dietary Guidelines for Americans:
   a. Choose fat-free or low-fat dairy products.
   b. Maintain a diet low in saturated fats, trans fats, cholesterol and salt.
   c. Avoid packaged and prepared foods.
   d. Increase our fruit and vegetable intake.

8. How many cups of fruit should men and women 19-30 years old consume per day?
   a. 1
   b. 2
   c. 3
   d. 4

9. A 1 ounce serving of cheese is the size of:
   a. 2 ping pong balls
   b. An ice cube
   c. 2 stacked dice

10. True or False (Circle one): Unbleached enriched wheat bread is whole grain.

11. True or False (Circle one) Regardless of where they come from, the calories you eat are either converted to physical energy or stored in your body as fat.

12. Fill in the blanks. When reading a food label, any percent daily value under ____ % is considered low and anything over ____ % is considered high.

Please check the box that best matches your answer.

For the purpose of this survey, eating healthily means that ‘around one third of what you eat each day should be fruit and vegetables, one third should be bread, potatoes, pasta and rice and one third should be split between milk and dairy products and meat, fish, pulses etc. Fatty foods (e.g. chips, crisps, and sugary foods e.g. cake, sweets should be kept to a minimum.)’


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Thank you for your participation!
Nutrition Basics Follow-Up Survey

1. Please select your gender:
   a. Male
   b. Female
   c. Prefer not to answer

2. Please select your age:
   a. 17-19
   b. 20-22
   c. 23-25
   d. 26+
   e. Prefer not to answer

3. Please select your year in school:
   a. 1st year
   b. 2nd year
   c. 3rd year
   d. 4th year
   e. 5+ year
   f. Prefer not to answer

4. Please answer the following questions to the best of your ability:

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16. Fill in the blanks. When reading a food label, any percent daily value under ____ % is considered low and anything over ____ % is considered high.

Please answer the next question based on your eating behaviors during the last month. Check the box that best matches your answer.
In the past month how often did you…

<table>
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<tr>
<th></th>
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<th>“Sometimes”</th>
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