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Predicting Motivation, Exercise Behavior And The Reciprocal Relationship With Obesity Perceptions In College Students

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PREDICTING MOTIVATION, EXERCISE BEHAVIOR AND THE RECIPROCAL RELATIONSHIP WITH OBESITY PERCEPTIONS IN COLLEGE STUDENTS

by

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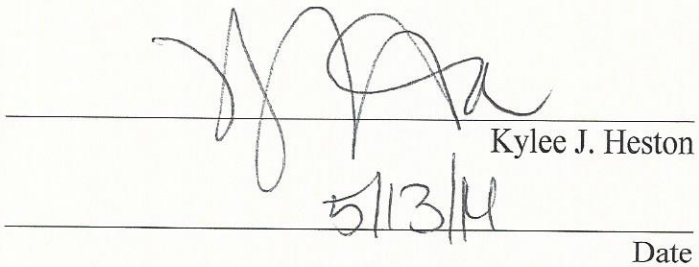

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ABSTRACT

Obesity is an increasing problem worldwide, often described as an epidemic. Approximately 70% of men and women nationwide are overweight and/or obese, with roughly 34% meeting criteria for obesity. Women are increasing obesity rates faster than men and more women than men are currently obese nationwide and worldwide. Obesity leads to numerous physical, psychological, and social consequences and often a poor quality of life. Women are at risk for increased health complications, and college in particular has been associated with weight gain. Improper energy balance is a significant contributor. Achieving adequate exercise each week has been proven effective in obesity prevention, weight loss, and weight maintenance. To date, obesity prevention campaigns have displayed only small to moderate effectiveness and behavior change has been minimal and short-lived. The current study used the Protection Motivation Theory (PMT) to assess female college students' perceptions of the threat of obesity to themselves, the perceived consequences of obesity, and the costs/benefits of exercising. Participants were provided with information regarding obesity implications and benefits of exercise (experimental group) or benign information (control group), and intent toward and actual behavior change after two weeks were assessed. High self-efficacy and the perception of low response costs to engaging in exercise were significantly correlated with frequency of prior physical activity and predicted greater intent to exercise and higher frequency of exercise at the two-week follow-up. While the treatment paradigm did not lead to

significant exercise behavior change, exercise behavior increased in the expected direction. Such results suggest that campaigns promoting obesity prevention provide ways to make exercise easy to achieve, with low personal cost to the individual, as well as increasing individuals' belief that they are capable of engaging in exercise.

CHAPTER I

INTRODUCTION

Obesity has become a worldwide epidemic. This is particularly the case in countries where high calorie foods are plentiful and physical activity rates have declined (Centers for Disease Control and Prevention [CDC], 2010a; World Health Organization [WHO], 2011a). Such increases in weight have led to an increase of various physical and psychological health issues, as well as social stigmatization and diminished quality of life. There are various antecedents of obesity worldwide; along with various methods for prevention, such as increasing one's physical activity level. Reducing one's weight through exercise can lead to amelioration and even reversal of the physical, psychological, and social consequences associated with being overweight (Hansen, Dendale, van Loon, & Meeusen, 2010). Protection Motivation Theory (PMT) is an effective theoretical framework for predicting physical activity through assessment of the individual's perceived risk of obesity and the consequences associated with obesity, perceived benefits of exercise, and the costs and benefits associated with exercise behavior (Milne, Sheeran, and Orbell, 2000). Within the context of risk of obesity, this study used the PMT model to evaluate physical activity intention in a female college population, as well as any behavior change following an informational intervention on the impact of obesity. The specific objectives of this study are described following a review of the relevant literature.

Prevalence and Consequences of Obesity

The World Health Organization (WHO) reported that in 2008 an estimated 1.5 billion adults over the age of 20 worldwide were overweight (Body Mass Index (BMI) ≥

25 and < 30, calculated as a ratio between height and weight) or obese (BMI ≥ 30), and of these more than 200 million men and close to 300 million women were obese (2011a). The WHO study also reported that nearly 43 million children under the age of five were overweight. At current rates, the WHO predicts that by the year 2015, 2.3 billion adults will be overweight and more than 700 million will be obese. Overweight and obesity rates appear to also be rising in low- and middle-income countries, particularly in urban areas (WHO, 2011a). Increases in obesity rates are expected to soon affect life expectancies; for example, in the United States, life expectancies are predicted to decline by up to five years unless the trends in obesity are reversed soon (Brownell & Yach, 2005).

Obesity rates in the United States have increased dramatically in the past 20 years. Between 1985 and 1990, all states with appropriate data collection procedures reported obesity rates of less than 14%. In 2009, Colorado and the District of Columbia were the only areas with an incidence of obesity under 20%, while 33 states had obesity prevalence rates greater than or equal to 25% and nine of these states had obesity rates greater than or equal to 30% (CDC, 2010a). In 2010, based on data from the 2010 National Health and Nutrition Examination Survey (NHANES), the CDC reported that nationwide, 73.2% of men and 64.5% of women are overweight or obese and 33.9% of men and 35.9% of women are obese. Among these, 4.3% of men and 7.7% of women are considered severely obese (BMI ≥ 40; CDC, 2010d). In individuals aged just 20-44, males are 37.7% overweight, 31.2% obese, and 4.1% severely obese; while females are 25.8% overweight, 33.2% obese, and 7.6% severely obese. On the other hand, nationwide only 25.8% of males and 33.2% of females are at a healthy weight (30.3% and 38.2% of

men and women aged 20-44, respectively). From these numbers it is clear that although men have greater numbers of being overweight and obese overall, women are more likely to be obese while men are more likely to be in the overweight category (CDC, 2010d).

Overweight and obesity are labels given to weight ranges that are greater than what is commonly considered healthy. Such weight ranges are typically defined using a height to weight ratio resulting in a calculation of Body Mass Index (BMI). For adults, a BMI of 25 to 29.9 is considered overweight, while a BMI of 30 or greater is considered obese (CDC, 2010b). Because calculation of BMI does not directly consider degree of body fat, highly athletic individuals or others with large muscle mass may fall into the overweight category (CDC, 2010b). Despite this limitation, BMI continues to be largely used because it is a fairly reliable tool for estimating body fatness for most people and has been shown to correlate with more direct measures of body fat such as underwater weighing and measurement of skinfold thickness (CDC, 2011a; Mei et al., 2002). Measurement of BMI is simple and inexpensive, making it a good tool for use in weight category screening (CDC, 2011a). As BMI increases, so does risk for various health and psychological complications (National Heart, Lung, and Blood Institute [NHLBI], 2010).

Obesity has been implicated as a causal factor in numerous health conditions, including type 2 diabetes, coronary heart disease, various cancers, hypertension, dyslipidemia, stroke, liver and gallbladder disease, sleep apnea and other respiratory problems, osteoarthritis, gynecological problems including infertility, increased pregnancy complications, and psychological problems including depression (CDC, 2010b; Kivimaki et al., 2009; Luppino et al., 2010; Wane, van Uffelen, & Brown, 2010). Increases in obesity and associated medical complications have led to an increase in

annual medical expenditures, with an estimated 147 billion dollars spent each year on the healthcare cost of obesity (CDC, 2010b).

Healthcare costs are also increasing due to rises in obesity rates. As indicated above, in 2008 it was estimated that 147 billion dollars each year are spent on the healthcare cost of obesity. In 2006, annual medical expenditures due to obesity alone rose to 9.1% from 6.5% (CDC, 2010b). It is estimated that half of these medical costs are financed by tax-payer funded programs such as Medicaid and Medicare (Finkelstein, Fiebelkorn, & Wang, 2003). Employers are also feeling the burden, with medical expenses estimated to be 42% higher for an obese employee than for a person with a healthy weight. Obesity increases the risk for disease, thereby increasing hospitalizations, employee absenteeism, and physical disabilities potentially leading to an individual being unable to work (CDC, 2010b; Finkelstein, et al., 2003). Obesity prevention strategies may serve to decrease hospitalizations, thereby reducing medical expenditures.

Psychological disorders have also been shown to be more prevalent in individuals who are overweight or obese (Kivimaki et al., 2009; Luppino et al., 2010). Depression especially has been shown to coincide with obesity. A recent meta-analysis of the literature reviewed studies assessing the longitudinal, bidirectional relationship between depression and overweight/obesity (Luppino et al., 2010). These authors assessed whether being overweight/obese is predictive of depression and whether depression is predictive of being overweight/obese. The authors concluded that the relationship between depression and overweight/obesity is bidirectional in that obese individuals have a 55% greater risk for depression over their lifetime than non-obese individuals, but at the same time depressed individuals have a 58% increased risk of obesity over non-depressed

individuals. This bidirectional relationship may be related to various factors including that depressed individuals may be more likely to become obese due to dysregulation of stress systems, obesity may increase in depressed individuals because of side effects of antidepressant medications, unhealthy lifestyles may develop as a consequence of dealing with depression, or obese individuals may be more likely to become depressed due to negative self-image or the somatic consequences of being obese (Luppino et al., 2010). Faith et al. (2011) in another review of the literature, found a higher likelihood of obesity leading to depression, with depression leading to obesity less often.

Further complicating the link between obesity and depression is that obese individuals are more likely to overeat leading to additional weight gain during periods of depression (Murphy et al., 2009). Positively, levels of depression and anxiety have been found to decrease coinciding with weight loss after bariatric surgery (Anderson et al., 2010) and with weight loss through behavioral intervention (Linde et al., 2011), suggesting that weight loss can lead to improved emotional well-being.

Thomas, Hyde, Karunaratne, Herbert, and Komesaraoff (2007) qualitatively assessed the experiences of 76 individuals whose BMI qualified them as obese. Individuals described frequent social discrimination and stigma, both as overweight children and obese adults. As overweight children, these adults described experiences of social isolation, being bullied or teased by peers, and deliberate exclusion from recreational activities, all of which participants stated intensified in high school. As adults, these individuals have faced unfriendly comments from strangers regarding weight and have been refused for hire or been fired from a job based on weight. Additional personal struggles cited were an inability to find clothes that fit, inability to

use seatbelts, having to purchase two plane tickets to fly, inability to attend theatres, and inability to attend university lectures due to desk size (Thomas et al., 2007). Nearly half of the individuals in this study cited poor mental and emotional health associated with their being obese, including low self-esteem, eating disorders, depression, social isolation, and inability to form and maintain personal relationships.

Lewis et al. (2011) discovered similar types of abuse experienced by the obese participants in their study. These obese individuals experienced verbal abuse by family, friends, and strangers; environmental stigmatization with seating, clothing, and even fitness facilities not accommodating obese individuals; and indirect stigma related to fear that friends and family were embarrassed of them, fear of public humiliation, and witnessing ridicule of other overweight individuals in front of the participant. Lewis et al. (2011) indicated that these obese individuals found it difficult to respond to such stigma and blamed themselves or decided they deserved such negative evaluation. Again, nearly half of these individuals described negative effects on their mental and emotional wellbeing, including low self-esteem, depression, anxiety, and lack of self-confidence. They also described avoiding physical activity, avoiding eating in public, social isolation, and difficulty with forming new relationships and maintaining current relationships.

In line with the findings of the above studies, Body Mass Index has been shown to be directly related to health related quality of life (HRQL), with a relationship between higher BMI and impaired levels of HRQL (Fontaine, Cheskin, & Barofsky, 1996). Lillis, Levin, and Hayes (2011) found that the effect of BMI on HRQL is likely in part accounted for by weight self-stigma, internalizing the negative stereotypical beliefs about weight held by others; and experiential avoidance, an avoidant coping process in which

the individual attempts to avoid or change difficult thoughts, feelings, and bodily sensations even when causing self-harm. Puhl and Brownell (2006) found that weight based discrimination led to avoidant style coping behaviors such as eating, avoiding dieting, negative self-talk, avoidance of social situations, and avoidance of situations with the potential for evaluation by others such as exercise. This avoidant behavior often leads to poor weight loss outcomes. Together, past research documents multiple negative physical and psychological consequences of obesity.

Causes of Obesity

An individual's body weight and composition results from a variety of factors including genetics, physiology, environment, individual behavior, socioeconomic status, and culture. Further complicating the equation is that weight gain can be exacerbated by various diseases and health complications, as well as certain medications (CDC, 2010b). A lack of knowledge related to appropriate health behavior adds to the problem. Specific influences on obesity are discussed below.

Genetics. Research shows that genetics play a role in obesity as our genes regulate our body's capture, store, and release of energy from foods. Research suggests, however, that changes in our genetic makeup occur much too slowly to be solely responsible for the recent dramatic rise in obesity (CDC, 2010a). Our genetics can certainly contribute to obesity as described, for example, in the so-called "energy-thrifty genes" hypothesis. This hypothesis argues that our genetics predispose us to overeat and to store excess calories for later use because of a genetic history of environmental conditions in which the availability of food has been unpredictable. The hypothesis goes on to state that these energy-thrifty genes that once aided in the survival of our ancestors

during times of food scarcity are currently being tested with an overabundance of food availability (Siervo, 2009).

Environment and individual behavior. Environment and individual behavior appear to play large roles in weight gain, and they are typically the most likely areas targeted for prevention and treatment. An individual's environment affects both food choices and physical activity levels and can be defined broadly in terms of geographical area or more narrowly in terms of family, workplace, and/or school (Pearson, MacFarlane, Crawford, & Biddle, 2009; Seally, 2010). The physical structure, availability of resources, and modeling behavior of others all combine to play a role in how such environments relate to overweight and obesity (Pearson et al., 2009; Seally, 2010).

Structural design characteristics of communities in which individuals reside have also been shown to play a role in the obesity epidemic. Beginning after World War II, community zoning laws served to spread the distances between homes and industry leading to an increase in the need to use automobiles for transportation. Many cities nationwide continue to have structural deficits limiting the option of individuals being able to walk, bike, or utilize public transportation to get to work (Black, 1990). Physical activity levels have also been impacted by an increase in video and DVD rental and entertainment facilities throughout communities (Dorfman & Yancey, 2009). Both structural distance and the high cost of or limited resources for fitness facilities in many communities impact activity (Sallis & Glanz, 2009).

In the home environment, family structure influences how family members behave. Home environments may be typically more sedentary, much free time may be

spent watching television, and food choices may be of poor nutritional value. Such environments can be particularly detrimental to children who often have little independence in choosing the types of food they consume (Seally, 2010). Family circumstance including employment status, parental education, and number of children may impact the ability of families to consume healthy foods (Pearson et al., 2009).

Education and socioeconomic status. Research shows that individuals who are less educated are more likely to engage in unhealthy eating. Dutta and Youn (1999) estimated that education, taken together with age, gender, and income, accounts for 16% of the variance in healthy nutritional practices. Webbink, Martin, and Visscher (2010) provide further support for this finding in a study of twins that assessed the relationship between obesity and education. They found that higher levels of education were associated with lower risks of obesity. Karlamangla, Merkin, Crimmins, and Seeman (2010) found an inverse relationship between socioeconomic status and risk factors for cardiovascular disease including those related to obesity; as socioeconomic status declines, risk factors increase. Similarly, Beydoun and Wang (2010) found an inverse relationship between BMI and socioeconomic status, particularly for women.

Health education. An insufficient knowledge base is also contributing to the problem. Unfortunately, studies suggest that the consumer knowledge base of how to lose weight and/or maintain a healthy weight is limited. Rukavina and Li (2011) showed that adolescents have a limited understanding of factors contributing to weight loss, often placing blame solely on the individual, rather than considering environmental factors as part of the problem. These children equated overweight children with being "lazy" and suggested that weight loss should be easy, simply requiring more "will power". Adults

cited by Thomas et al. (2007) stated that they did not know the proper way to lose weight and maintain the loss, having tried multiple methods in the past. All individuals in this study had attempted weight loss at least once, with women generally beginning to attempt various diets in their teens and men in their early twenties.

Due to an inadequate knowledge based, individuals frequently turn to fad diets, which often have little success. Participant responses to a qualitative analysis about the experience of being classified as obese suggest repeated attempts toward and failure with dieting (Thomas et al., 2007). Attempts toward weight loss with these individuals included diet programs such as Jenny Craig and Weight Watchers, weight loss shakes, medications for weight loss, and even bulimia. Such a limited knowledge base has also led to exploitation of individuals through the massive weight loss industry. A news article at the height of the obesity epidemic cited profits estimated as high as $40 billion (CDC, 2010b; Sherrid, 2003), which has likely increased further since that time. Unfortunately, most diets quickly fail due to extreme limitations in caloric intake, and before long the individual must either stop the diet or suffer the consequences of starvation (Applebaum, 2008). As will be discussed below, a large factor in weight loss/maintenance is the proper combination of healthy diet in conjunction with proper exercise that will lead to sustainable lifestyle changes, improved health, and lower risk for obesity.

Obesity Risk Factors in College Students

College students may be at particular risk for weight gain due to their unique circumstances given many of the environmental and economic risk factors previously described. Particular risk factors for college students include low personal income, reliance on dormitory cafeteria foods, the physical structure of their environment, lack of

transportation, high cost of healthy foods, easy access to fast food, contraceptive use, increased stress, and transition into the independence of university life (Jackson, Berry, & Kennedy, 2009; Wane et al., 2010). Research has also shown that college students' physical activity levels are below recommended guidelines (Driskell, Kim, & Goebel, 2005). Individuals who continue to live at home while attending college are more likely to eat healthier, pack lunches, and purchase less food on campus (Jackson et al., 2009).

A recent review of the literature showed that the first year of college is a critical time period for weight gain, with the average student gaining an average of 3.3 pounds in the first year (Wane et al., 2010). Similar findings have been reported, at least for women, in general population studies. For example, Adamson et al. (2007) found that women in Australia between the ages of 18-23 gained an average of 1.4 pounds per year over a 10-year period. Wane et al. (2010) reported that similar results have been found for women in Europe. Wang and Beydoun (2007), in a systematic review of the literature, found that in the United States, women ages 20-34 years have shown the fastest increases in obesity rates among adults since 1980. Racette, Deusinger, Strube, Highstein, and Deusinger (2008), in a longitudinal study following college students from freshman through senior year, found that weight gain becomes less rapid after freshman year, however steady increases are observed. These researchers also reported that one- third of their study population did not meet recommended exercise guidelines and less than one- third met dietary guidelines for fruit and vegetable consumption. Huang et al. (2003) found that, of more than 700 college aged students, greater than 69% did not meet daily recommendations for fruit and vegetable intake and most students exercised less than three times per week, not meeting recommendations for physical activity.

Results from the Nutrition Examination Survey and the National Longitudinal Study of Adolescent Health showed that a large number of adolescents become obese and remain obese during the transition from adolescence to adulthood (Desai, Miller, Staples, & Bravender, 2008). Such individuals are at higher risk of remaining obese throughout adulthood. Vella-Zarb and Elgar (2009) pooled data from over 3,000 college aged participants and found an average weight gain of nearly four pounds during the freshman year in college. Contributing factors to weight gain included high baseline weight, recent dieting, and psychological distress (Vella-Zarb & Elgar, 2009).

The consequences of obesity can already be seen in college students. Morrell, Lofgren, Burke, and Reilly (2012) screened more than 2,000 college men and women and found the majority (77%) of men and more than half (54%) of women met at least one criterion for metabolic syndrome. Fat intake, poor nutrient intake, increased BMI, and low physical activity levels were related to risk for metabolic syndrome, suggesting that college students are at an increased risk for obesity related illness.

Infertility is another consequence of obesity, and particularly salient to college females who are at or near childbearing age. Obese women are almost three times more likely than non-obese women to experience infertility and take longer to conceive (Gesink-Law, Maclehose, & Longnecker, 2007; Purcell & Moley, 2011). When pregnancy does occur, these women are at an increased risk for miscarriage, gestational diabetes, preeclampsia, and congenital birth defects in the infant (Purcell & Moley, 2011). Purcell and Moley (2011) found that obesity negatively impacts egg development. Luckily, studies find that even modest weight loss can improve many of the negative effects of obesity on reproduction (Purcell & Moley, 2011).

Reversing Obesity Trends

Given the above risk of becoming obese and the resulting consequences, including heart disease, cancers, infertility, depression, and social isolation and ridicule, it is imperative to consider avenues for prevention of obesity in college populations (CDC, 2010b; NHLBI, 2010). Sustained healthy eating practices appear difficult for most adults and involve a continual tradeoff between nutrition and taste, price, convenience, and cost (Blaylock, Smallwood, Kassel, Variyam, & Aldrich, 1999). Improving the nutritional quality of foods throughout schools and college campuses, reducing access to and the abundance of fast food, providing avenues for healthier food choices throughout communities, and increasing the availability of physical activity are all environmental changes that make it easier for individuals to engage in healthy behavior (Dorfman, & Yancey, 2009; Sallis & Glanz, 2009).

Energy imbalance is a significant causal factor in obesity (Hall et al., 2011). Achievement of a healthy weight over the lifespan is directly related to energy balance in the body. Individuals must work to balance the ratio of calories consumed with calories expended to achieve a healthy weight (CDC, 2010b; Hall et al., 2011). Both healthy nutrition and an increase in physical activity are of strong importance in achieving and maintaining a healthy weight (CDC, 2010b). Poor nutrition and decreases in physical activity are the second leading causes of preventable morbidity and mortality. Improving these practices is among the top priorities of the Healthy People 2020 campaign (U.S. Department of Health and Human Services [USDHHS], 2011).

Nutrition. The WHO (2011a) suggests that a global shift in individual diets has led to an increase in the overweight and obesity rates worldwide. Specifically, there has

been a global trend toward increasing the intake of energy-dense foods that are low in vitamins and minerals yet high in fat and sugars. Limiting energy intake from fats and sugars and increasing consumption of fruits, vegetables, legumes, whole grains, and nuts is important in producing weight loss and reducing risk of weight-related disease (WHO, 2011a). Even for healthy weight individuals, high fat diets may contribute to chronic inflammatory diseases of the airway and lung and cardiovascular disease, which is already the number one cause of death worldwide (Rosenkranz, Townsend, Steffens, & Harms, 2010; WHO, 2011a). Diet is also a significant contributor to diabetes, which has itself become a global epidemic (CDC, 2011c; WHO, 2011a). The WHO has predicted that deaths related to diabetes will increase by more than 50% worldwide in the next 10 years (WHO, 2011a). Such statistics make nutrition a top priority in the fight toward disease prevention and healthier weight.

While sound nutrition is important in losing and maintaining weight, it is even more effective when paired with exercise. A healthy diet in conjunction with exercise improves fat oxidation, saves lean body mass, and provides short-term suppression of hunger (Borer, 2008).

Physical activity. Physical activity has been deemed beneficial in achieving and maintaining a healthy weight. The WHO (2011b) has stated that physical inactivity is the fourth leading risk factor for deaths worldwide. In 1995, it was estimated that 30% of all cancer deaths are related to insufficient physical activity (Plante, Gustafson, Brecht, Imbery, Sanchez, 2011). Colon, kidney, pancreatic, endometrial, breast, and esophageal cancer are all associated with being overweight or obese; and many of these cancers are

linked with low levels of physical activity (American Cancer Society, 2012). The WHO states that 31% of individuals worldwide are not physically active (2011b).

Activity guidelines set forth by the CDC (2011b) and WHO (2011b) state that promotion and maintenance of a healthy weight, improvement in cardio-respiratory functioning, increases in muscular fitness, and prevention of disease and depression require 150 minutes of moderate-intensity physical activity or 75 minutes of vigorously intense physical activity each week. Additional recommendations include muscle strengthening activity performed at least two days each week. Moderate- and vigorous-intensity activities may be performed in an equivalent mix of the recommended amounts. The CDC and WHO suggest that breaking up the activity throughout the week and day is recommended, with 10 minutes of activity in one session being enough to achieve the desired effects. To gain even further health benefits, including increased disease prevention; adults are encouraged to move beyond the minimum recommendations for physical activity described above.

In a review of the literature, Hansen et al. (2010) found that for obese individuals, endurance-type exercise was shown to lead to adipose tissue fat loss, and exercise in addition to diet restriction led to greater decreases in abdominal fat. Endurance exercise also led to reduction or prevention of muscle mass decline. Such reduction in fat led to decreases in obesity and reduction of metabolic syndrome, type 2 diabetes, and heart disease. Greater training frequency and longer duration of the training program led to increased benefits. High intensity interval training has been shown to be especially beneficial.

Lower impact physical activity has also been found to be beneficial toward maintaining and achieving a healthy weight, and research has shown that it is easier to maintain (Seigel, Brackbill, & Heath, 1995; WHO, 2011b). Such low impact activities can be made part of regular daily routines, including recreational or leisure time activity, activity through transportation such as walking or cycling, physical activity through work, household chores, sports, games, play, and planned exercise (WHO, 2011b). For instance, walking just one extra mile each day is associated with an approximate six pound weight loss per year (MacDonald, Stokes, Cohen, Kofner, & Ridgeway, 2010).

Psychological health is also benefited by exercise. Exercise has been found to lead to decreases in stress, anxiety, and depression, and an increase in positive mood and self-confidence (Plante, Gustafson, Brecht, Imbery, & Sanchez, 2011). Rose and Parfitt (2012) found that women who were active for their study experienced heightened positivity, however women who were active regularly outside the study were found to have higher levels of positive affect and higher self-efficacy. This research suggests that more experience with exercise has even higher benefits of mood improvement. Anderson and Brice (2011) found that as little as 10 minutes of exercise can produce improvement in mood.

Due to the importance of encouraging and engaging in physical activity, the CDC and WHO have developed programs and campaigns to increase physical activity nationwide and worldwide. Such programs include the CDC's Best Bones Forever which promotes bone health for young girls and their best friends encouraging them to "grow strong together and stay strong forever"; the CDC/WHO Collaborating Center: Promoting Physical Activity Across the Globe which provides research, consultation, and

workshops promoting physical activity, disease prevention, and health enhancement around the world; the CDC's Kids Walk to School encourages kids to walk to school and encourages creation of safe walking environments; the CDC's Growing Stronger: Strength Training for Older Adults which provides a research based exercise program for older adults; CDC's LEAN Works! Leading Employees to Activity and Nutrition focuses on increasing both nutrition and physical activity in the workplace; CDC's State-Based Nutrition and Physical Activity program provides more than $119 million to US states in efforts to improve nutrition and increase physical activity; PEP: A Personal Empowerment Plan encourages healthy eating and physical activity in the workplace; CDC's Physical Activity: the Arthritis Pain Reliever; the CDC's Small Step Program promotes small changes in physical activity and nutrition; CDC's StairWELL to Better Health encourages businesses to make stairwells more visually appealing with art and motivating signs to encourage employees to use the stairs; the CDC's State Physical Activity Directory highlights physical activity events taking place in various states; the CDC's VERB Youth Media Campaign promotes daily physical activity; and WISEWOMAN which provides knowledge and skills to low-income and/or under-insured women ages 40-64 in an effort to improve nutrition and physical activity (CDC, 2010b; CDC, 2010c). The WHO has also been involved, and in 2004 the World Health Assembly adopted the WHO Global Strategy on Diet, Physical Activity, and Health in order to improve healthy diets and increase physical activity worldwide with the aim to prevent chronic illness related to overweight and obesity (WHO, 2011a).

Perceived risk and behavior change. Although such health promotion programs are a step toward creating behavior change, lasting behavior change is difficult to

achieve. One complication related to this is that many individuals have a misperception of health threats as it pertains to them. This may be especially true in young adults. Studies to date have found that young adults have an under-appreciation for their risk of developing heart disease and diabetes (Collins, Dantico, Shearer, & Mossman, 2004; Mosca et al., 2000; Ponder, Lee, Green, & Richards, 1996; Wendt, 2005). On the other hand, young adults often have a misperception that they are at high risk for developing certain cancers, especially breast cancer (Smith, Dickerson, Sosa, McKyer, & Ory, 2012; Wendt, 2005). Wendt (2005) found that females under the age of 30 overestimate their risk of breast cancer by over 72 fold. Smith et al. (2012) found support for these previous studies, finding that young adult females (aged 18-24) displayed a significant incongruence between their perceived risk of developing cancer and the actual rates of cancer in this population. While perception of cancer risk is high, in actuality the rate of heart disease for all age groups is higher than the rate of cancer (CDC, 2008). This is concerning considering that 73.2% of men and 64.5% of women are overweight or obese (CDC, 2010d), suggesting that misperceptions of health risk may lead to lack of perceived health risk associated with obesity. This points to a lack of knowledge related to health risks and obesity.

Those listed above, along with other state, national, and worldwide campaigns, have attempted to provide increased knowledge related to obesity in an effort toward prevention and weight loss. Unfortunately, research suggests that health campaigns have had only small to moderate effects in changing attitudes, beliefs, and behaviors (Emery, Szczypka, Powell, & Chaloupka, 2007). Such findings suggest that more must be done to identify factors that will lead to lasting behavior change, improved health, and lower

obesity levels at the national level. Racette et al. (2005) found that behaviors engaged in during college are especially influential throughout the individuals' adult life, suggesting that healthy behavior promotion and intervention may be especially valuable in this stage of life. Nelson, Story, Larson, Neumark-Sztainer, and Lytle (2008) agree, stating that young adulthood is a key time to instill positive behaviors to ensure health behavior into adulthood. They described young adulthood as a time for identity development and changes in social support networks. College is also a time when there is high access to reaching this population, making it a prime time for education and intervention (Nelson et al., 2008). As described in the subsequent section, Protection Motivation Theory may be used to better understand college students' perceptions toward risk for obesity, risk factors associated with obesity, and the benefits of exercise in prevention and reduction of obesity. Assessing individuals' perceptions of the threat of obesity to themselves, the actual threat of consequences to themselves, and the costs/benefits of exercising or not, may provide better understanding of the motivation toward exercise and weight loss/maintenance. Enhancing our understanding of the factors that lead to positive behavior change may guide future health promotion/prevention programs that will lead to longer lasting behavior change.

Protection Motivation Theory

Protection Motivation Theory (PMT) is a model extended from Becker's (1974) Health Belief Model (HBM). The HBM suggests that behavior is a function of the subjective value of expected outcome (Rosenstock, 1966). Therefore, engagement in a behavior is reliant on how much the individual values a particular health goal, as well as the belief that the behavior will result in achievement of that goal. It has been posited that

an increase in perceived severity of and susceptibility to negative health outcomes will cause an increase in perceived threat of disease (Floyd, Prentice-Dunn, & Rogers, 2000; Milne et al., 2000). Such perceived threat is then expected to increase the likelihood that an individual will engage in a healthier alternative behavior (Kohler, Grimley, & Reynolds, 1999). With exercise, the assumption is that when provided with information related to susceptibility to and health threats associated with not engaging in regular exercise, the result would be an increase in exercise behavior.

Similar to the HBM, PMT posits that motivation toward health protection results from a perception of and an effort to avoid a negative health outcome. PMT is structured somewhat differently from HBM in that there are two cognitive processes, threat appraisal and coping appraisal, that contribute to motivation and lead to behavior (see Figure 1). The threat appraisal process includes evaluation of the maladaptive behavior. Threat appraisals include both intrinsic and extrinsic maladaptive response rewards, perceived severity of and vulnerability to a health threat, and fear. Rewards increase the likelihood of engaging in a maladaptive behavior, despite any health risk; whereas higher perception of threat will decrease engagement in maladaptive behavior (Floyd et al., 2000). In deciding whether to engage in an exercise behavior, individuals evaluate the severity of health and social threats associated with obesity (e.g., heart disease, depression, social isolation) along with their level of fear related to becoming obese or to these specific health and social threats. The individuals also evaluate any rewards associated with not engaging in the adaptive behavior (e.g., watching TV may be perceived as more pleasurable than running).

The coping appraisal process includes assessment of one's ability to cope with engagement in an adaptive response. Coping appraisals include response efficacy (RE, the belief that the adaptive behavior will be beneficial and protective), self-efficacy (SE, the belief that one can actually engage in the adaptive response), and response costs (any behaviors associated with engaging in the adaptive behavior). RE and SE increase the likelihood of engaging in adaptive behavior, while response costs decrease the likelihood (Floyd et al., 2000). During the coping appraisal process, individuals will decide how effective they believe exercise is at combating obesity and/or preventing the negative effects associated with obesity, while also appraising their ability to actually engage in exercise (e.g., may feel too overweight, may have an injury). This will include an evaluation of any response costs stemming from engaging in the exercise behavior (e.g., loss of personal time, potential soreness).

The evaluation of threat and coping factors combine to form protection motivation (intention) which leads to prediction of initiation, continuation, or inhibition of an adaptive behavior (Floyd et al., 2000). Thus, when individuals evaluate the threat and coping factors associated with obesity and exercise, these evaluations will lead to some level of intention (protection motivation) and lead to engagement in a behavior (exercise or no exercise).

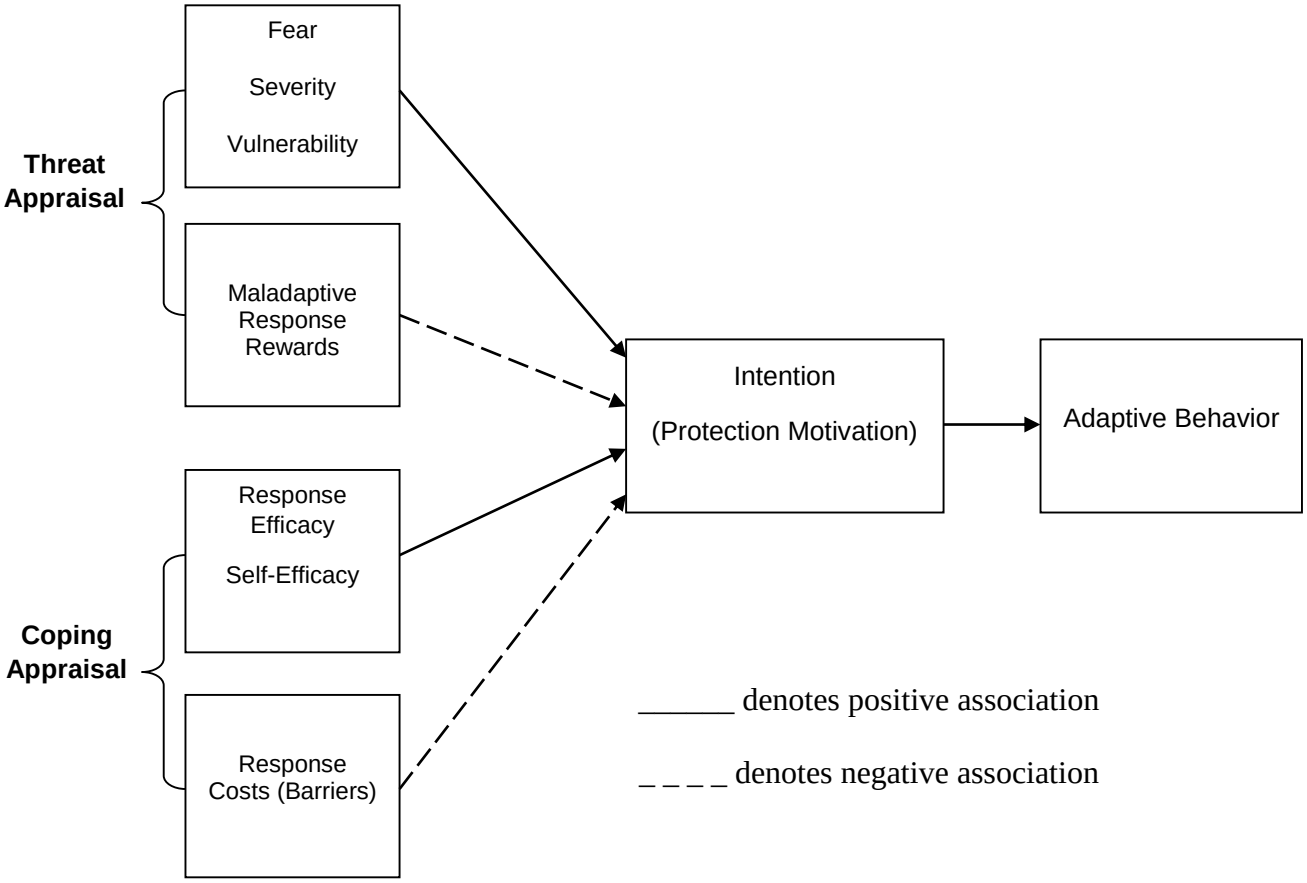

Figure 1: Main Components of Protection Motivation Theory

Empirical Support for the Protection Motivation Theory

Thus far PMT has been applied to numerous topics including health promotion and disease prevention, injury prevention, politics, environmental concerns, and protection of others (Rogers & Prentice-Dunn, 1997). The majority of studies have been related to health promotion and disease prevention, including exercise and diet, smoking, alcohol, cancer prevention, AIDS prevention, and adherence to medical regimens (Floyd et al., 2000).

In a meta-analysis of the existing literature related to all content areas, Floyd et al. (2000) found the overall effect size of the PMT model to be in the moderate range, with all of the mean effect sizes being statistically significant. Milne et al. (2000), in their own meta-analytic review, also found all PMT variables to be significantly correlated with intention in the predicted direction. As a whole, increases in threat severity, threat vulnerability, response efficacy, and self-efficacy led to engagement in adaptive behaviors; while decreases in response costs and maladaptive response rewards also led to an increase in adaptive behaviors. Each component of the model was linked with healthy outcomes. Evidence from these meta-analyses suggests that enhancing self-efficacy and response-efficacy may provide the greatest benefits and create the greatest change, with self-efficacy being the variable most often associated with intention in the predicted direction (Milne et al., 2000). These results suggest that treatment interventions including simple, easy to perform, adaptive behaviors will likely lead to the best results (Floyd et al., 2000; Milne et al., 2000).

Milne et al. (2000) also analyzed studies measuring behavior change. The meta-analysis found that all PMT variables, except fear, were significantly correlated with concurrent behavior in the predicted direction. The greatest association was between intention and concurrent behavior. Self-efficacy and response costs, as well as fear to a somewhat lesser extent, were most often predictive of concurrent behavior. Similarly, intention was most highly correlated with subsequent behavior. Perceived vulnerability, self-efficacy, and response costs were all correlated with subsequent behavior.

The advantage of the protection motivation theory over other social cognition models in predicting physical activity is that it has been subject to numerous

experimental evaluations (Milne et al., 2000). To date experimental manipulations related to PMT variables have typically included written communication in the form of a leaflet or health-education brochure and a television program (Milne et al., 2000). Variable manipulations may be conducted by providing one group with information related to high vulnerability, another low vulnerability, another high self-efficacy, and another low self-efficacy. Milne et al. (2000) found that all threat and coping appraisal variables, aside from response cost, had been successfully manipulated through experimentation. Those variables most difficult to manipulate had the strongest association with intention and behavior.

Exercise/dietary behavior research. Research specific to exercise and dietary behavior have included studies using a manipulation condition, or those evaluating PMT variables with no experimental manipulation. Those studies not using a manipulation condition have typically assessed the PMT variables (RE, SE, and response costs) and their relationship with intent toward behavior change (Hensen, Masakure, & Cranfield, 2008; Lippke & Plotnikoff, 2006; Plotnikoff et al., 2010; Plotnikoff, Rhodes, & Trinh, 2009; Plotnikiff & Higginbotham, 1995, 2002; Reid et al., 2007; Rhodes & Plotnikoff, 2005; Scarpa & Thiene, 2011; Tavares, Plotnikoff, & Loucaides, 2009; Tulloch et al., 2009). Behavior assessment has included reduction in fat intake (Plotnikoff & Higginbotham, 1995), use of supplements (Hensen et al., 2008), choosing an organic diet (Scarpa & Thiene, 2011), and exercise (Lippke & Plotnikoff, 2006, 2009; Plotnikoff et al., 2010; Plotnikoff, Rhodes, & Trinh, 2009; Reid et al., 2007; Rhodes & Plotnikoff, 2005; Tavares, Plotnikoff, & Loucaides, 2009; Tulloch et al., 2009; Umeh, 2004). Several of these studies used PMT variables to assess intent toward behavior change, and

then predicted and assessed follow-up behavior from times varying from one week to 6 months (Lippke & Plotnikoff, 2009; Plotnikoff et al, 2010; Plotnikoff, Rhodes, & Trinh, 2009; Reid et al., 2007; Tulloch et al, 2009).

As indicated above, studies including an experimental manipulation have typically included written communication or a brief video viewing. These have included assessment of behavior change or simply assessment of intent with no assessment of actual change. Behaviors measured have included dietary intake (Cox & Bastiaans, 2007; Cox, Koster, & Russell, 2004; Zhang & Cooke, 2011), use of supplements (Cox & Bastiaans, 2007; Wurtele, 1988), and exercise (Courneya & Hellsten, 2001; Fruin, Pratt, & Owen, 1991; McGowan & Prapavessis, 2010; Milne, Orbell, & Sheeran, 2002; Stanley & Maddux, 1986; Wurtele & Maddux, 1987; Zhang & Cooke, 2011). Those not assessing behavior change evaluated the PMT variables in relation to intent to change behavior (Courneya & Hellsten, 2001; Cox & Bastiaans, 2007; Cox, Koster, & Russell, 2004; Fruin et al., 1991; McGowan & Prapavessis, 2010; Stanley & Maddux, 1986). Of those assessing behavior change over time, follow-up behavior change assessment was performed at one week, two weeks, or four weeks (Milne et al., 2002; Wurtele, 1988; Wurtele & Maddux, 1987; Zhang & Cooke, 2011). Of these studies, two weeks was the typical time for follow-up measurement; while some of the studies added a one week or four week follow-up in addition to the two week follow-up session. In combination, dietary and exercise behaviors in these studies were predicted by intention, perceived vulnerability, self-efficacy, and fear.

Milne et al. (2002) assessed the effects of a motivational PMT based intervention using factual information regarding coronary heart disease to experimentally manipulate

the PMT variables. The PMT intervention was assessed in conjunction with a volitional (implementation intention) intervention to assess likelihood of adopting exercise behavior. The volitional intervention component was adapted from Gollwitzer (1993) and Heckhausen (1991) who proposed a two phase process for behavior change (the model of action phases) which suggests that a behavior is more likely to occur when the individual is motivated toward change and develops a specific plan for change. In the first, motivational stage, the individual weighs the costs and benefits of performing a behavior. In the second, volitional, phase, the individual develops an actual plan for behavior change. Zhang and Cooke (2011) used methods adopted from Milne et al. (2002) to assess motivational and volitional intervention related to dietary and exercise behavior change. Their study used information related to type 2 diabetes and the benefits of exercise (Zhang & Cooke, 2011). Both studies found that the combination of both motivational and volitional intervention led to greater behavior change than did either type of intervention administered alone (Milne et al., 2002; Zhang & Cooke, 2011).

Summary

Obesity is a growing problem both nationally and worldwide and has significant health, psychological, and social consequences (CDC, 2010b; NHLBI, 2010). Young adulthood is a critical time for providing information related to the detrimental effects of obesity and the importance of engaging in protective behaviors to prevent obesity and reduce current rates of obesity (Nelson et al., 2008; Racette et al., 2005). Although public health programs have been initiated, lasting behavior change is minimal and obesity rates continue to rise (Emery, Szczypka, Powell, & Chaloupka, 2007). Protection Motivation Theory has been shown to be effective in predicting those variables that lead to behavior

change (Floyd et al., 2000). While existing studies using PMT have included assessment of exercise behavior, they have not looked at these constructs within the realm of obesity prevention. Previous studies have also failed to include all components of the PMT model, often omitting evaluation of maladaptive response rewards. Finally, studies to date have not assessed the reciprocal relationship between adaptive behavior and the threat and coping appraisal components (e.g., does regular exercise predict perceived vulnerability?), instead focusing only on the predictive power of threat and coping appraisal processes in relation to the adaptive behavior (e.g., exercise).

Proposed Study

The current study applied the PMT framework within the context of obesity to predict and assess intention to exercise as well as actual exercise behavior change among female college students. There were three main objectives. The first objective was to examine how prior physical activity predicts coping and threat appraisal components of PMT (e.g., does exercise behavior predict perceived vulnerability to obesity?). As Rogers and Prentice-Dunn (1997) noted, this reciprocal link needed to be examined.

Hypothesis 1: Higher levels of exercise prior to engaging in the current study would be associated with higher levels of response efficacy and self-efficacy, and with fewer response costs to engaging in exercise (coping appraisal process). It was also expected that higher levels of prior exercise would be associated with lower perceived vulnerability, perceived severity, and fear of developing obesity; as well as fewer maladaptive response rewards from not exercising.

The second objective was to examine each threat and coping appraisal component of the PMT model as predictors of intent to exercise and actual exercise behavior. This

built on past research by including the rarely examined maladaptive response reward component.

Hypothesis 2: Perceived severity, perceived vulnerability, fear, response efficacy, and self-efficacy would positively predict intention to engage in the adaptive behavior of exercise; while maladaptive response rewards and response costs would negatively predict intent to engage in exercise.

Hypothesis 3: Perceived severity, perceived vulnerability, fear, response efficacy, and self-efficacy were expected to predict greater levels of subsequent exercise; while maladaptive response rewards and response costs were expected to predict lower levels of subsequent exercise.

The third objective was to apply an informational intervention to examine intent to engage in regular exercise, as well as actual exercise behavior change after two weeks. Similar to Milne et al. (2002), who assessed PMT variables related to exercise and coronary heart disease, the present intervention component included two groups: an experimental group receiving an informational treatment manipulation and a control group. Participants in the experimental group were provided with factual information based on components of the threat and coping appraisal processes in the PMT. Unique from studies to date, the current study included manipulation of all components of the PMT model, including perceived severity, perceived vulnerability, fear, and maladaptive response rewards (threat appraisal); and response efficacy, self-efficacy, and response costs/barriers (coping appraisal). Information was provided to individuals in the experimental group to enhance knowledge related to the health, psychological, and social effects of obesity (perceived severity, perceived vulnerability, and fear); benefits of

exercise in reducing these risks (response efficacy and self-efficacy); and helpful ways to consider the cost/benefit ratio of engaging in exercise behavior (maladaptive response rewards and response costs/barriers).

Participants in the experimental group were also asked to create a specific goal (volitional intervention) related to exercise behavior in the upcoming two weeks. As indicated above, previous studies have shown that adding a specific goal toward behavior change, in addition to providing motivation through manipulation of PMT variables, is most successful in creating positive behavior change (Milne et al., 2002; Zhang & Cooke, 2011).

Hypothesis 4: Individuals in the experimental group who receive the informational and volitional treatment component would display greater intent to exercise than those in the control group.

Hypothesis 5: Individuals in the experimental group would engage in higher levels of physical activity at the two week follow-up period in comparison to individuals in the control group.

Hypothesis 6: There would be a significant increase in physical activity level among the experimental group at the two week follow-up in comparison to the initial assessment.

CHAPTER II

METHOD

Participants

Initial participants were 230 female undergraduate students who completed Time 1 of the study. Of these 230 women, 80 did not complete Time 2, and another 20 women did not complete Time 2 within the eligible timeframe (participants were contacted two weeks after they completed Time 1 and were given seven days to complete the follow-up). This left data from 130 women who completed both Time 1 and Time 2 within the appropriate timeframe, on which all subsequent analyses are based. Based on a power analysis in which alpha was set at .05 and power was set at .80, this final sample of N = 130 exceeds the minimum sample size of N=128 required to detect a moderate effect in which between-subject factors could be examined while controlling for potential confounding variables in a univariate analysis of covariance (ANCOVA; G*Power 3.1; Buchner, Erdfelder, Faul, & Lang, 2009).

Participants ranged in age from 18-48 (*M* = 20.28, *SD* = 3.856), and included a majority Caucasian sample (Caucasian = 123 [94.6%], American Indian or Alaska Native = 3 [2.3%], Hispanic or Latino = 3 [2.3%], Asian = 1 [0.8%]). Participants identified their level in college as Freshman = 48 (36.9%), Sophomore = 38 (29.2%), Junior = 25 (19.2%), and Senior = 19 (14.6%).

Participants were recruited to participate in this two-part online study through the Psychology Department's online data management system, SONA (see Appendix A for the attached study description that appeared on the SONA webpage). Participant recruitment took place during the Fall 2012 academic semester. Each participant was recruited to complete both Time 1 and Time 2 of the study, with each component lasting approximately 30 minutes. Compensation for participation consisted of extra credit toward an eligible course of the student's choosing. Participants had the opportunity to earn one credit for completion of the entire two-part study. Participants earned one-half credit for Time 1 of the study, and an additional one-half credit for completion of Time 2.

Measures

Time 1 Measures. The following measures were completed by participants in both the experimental and control groups during Time 1 of the study.

Demographics (5 items). Demographic questions (see Appendix B) included gender, age, race/ethnicity, and year in college. Height and weight were also assessed in order to compute BMI to include as a possible covariate. Participants' perception of their weight category (e.g., underweight, normal weight, overweight, obese) was also assessed.

Prior Physical Activity (5 items). Physical activity questions were adapted from Milne et al. (2002) and modified to fit the needs of this study (see Appendix C). Questions concern patterns of exercise behavior in general and in the past two weeks. These questions assessed physical activity that produces a noticeable increase in breath rate. Three questions were taken directly from the Milne et al. (2002) study to assess general exercise frequency (how often do you typically engage in exercise?), any exercise in the previous two weeks (did you engage in exercise in the past two weeks: yes/no?),

and amount of times engaged in exercise in the past two weeks (how many times did you engage in exercise in the past two weeks?). The two week specification was a change from the one week specification used in the Milne et al. (2002) study. The current study added two questions to assess exercise duration (in minutes) in a typical exercise session and total minutes spent exercising during the previous two weeks. As in the Milne et al. (2002) study, participants were told that exercise sessions must be at least 20 minutes long and cause the person to breathe harder. Examples of exercise were given, including sport, swimming, cycling, or walking briskly. All participants were administered these questions during Time 1 of the study.

PMT Components (35 items). Protection Motivation Theory components were measured on 5-point Likert scales (see Appendix D). Statements were adapted from Milne et al. (2002), Plotnikoff, Blanchard, Hotz, and Rhodes (2001), Plotnikoff and Higginbotham (2002), and Ruthig (2013). All questions were modified as necessary to be related specifically to obesity and exercise. Some additional questions were created for the study to assess these PMT components as they specifically relate to the physical, psychological, and social effects of obesity.

Perceived vulnerability. Two questions adapted from Milne et al. (2002) were used to evaluate the participants' perceived likelihood of becoming obese in the future and how unlikely the participant is to develop obesity in the future. Responses for both items ranged from 1 (not at all strong) to 5 (very strong). Each participants' response to the latter item was reverse coded then added to their response to the initial item for a total perceived vulnerability score.

Perceived severity. Two items were adapted from Plotnikoff and Higginbotham (2002) to assess participants' belief that obesity is a serious physical, psychological, and social health problem: (1) "How serious of a health problem is obesity" (1 = not at all serious; 5 = very serious) and (2) "How much will obesity interfere with someone leading a normal life" (1 = not at all; 5 = very much so). Additional questions were devised for the current study to specifically address statements related to known health, psychological, and social consequences of obesity: (1) "Obesity can lead to diabetes, heart disease and stroke, and infertility", (2) "If left untreated, obesity can lead to depression and anxiety, social isolation, and poor quality of life", and (3) "Untreated, obesity can contribute to premature death". For these three items, responses ranged from 1 (strongly disagree) to 5 (strongly agree). Responses to all five items were summed to create a total perceived severity score.

Fear. Fear components were adapted from Milne et al. (2002) to focus on obesity. These four statements assessed individual feelings surrounding the thought of developing obesity: "The thought of developing obesity makes me feel… frightened, anxious, worried, scared" (1 = not at all; 5 = very). Responses to these four items were summed to create a total fear score for each participant.

Maladaptive response rewards. Maladaptive response rewards are the benefits that the individual perceives as coming from not engaging in the exercise behavior. These questions were taken from Ruthig (2012): (1) "Being physically inactive allows me to conserve energy", (2) "Being physically inactive allows me to save time for doing other things that I enjoy", and (3) "Being physically inactive helps me ensure that I won't strain, injure, or overexert myself". Responses ranged from 1 (strongly disagree) to 5

(strongly agree) and were summed for all three items to create a total maladaptive response rewards score.

Response efficacy. Response efficacy is the individual's perception of the effectiveness of the desired behavior. Statements taken from Plotnikoff and Higginbotham (2002) were modified toward obesity and exercise: (1) "If I were to exercise for at least 20 minutes each week I would reduce my chances of developing obesity" and (2) "Regular exercise would improve my chances of living longer". Statements borrowed from Plotnikoff et al. (2002) were used to further enhance understanding of response efficacy perception within the realm of exercise being beneficial in combating obesity: (1) "I would feel more confident about my health by getting regular exercise", (2) "Getting regular exercise would help me have a more positive outlook", (3) "Regular exercise would help me control my weight", and (4) "Regular exercise would improve my overall health". Additional statements added by the current researchers are: (1) "Regular exercise would help me to make more friends", (2) "Regular exercise would reduce the health risks associated with obesity", (3) "Regular exercise would provide me with a better quality of life", and (4) "I would feel more socially confident by getting regular exercise". Responses ranged from 1 (strongly disagree) to 5 (strongly agree) for all items and were summed across all 10 items to create a total response efficacy score for each participant.

Self-efficacy. Self-efficacy is the understanding of the individual's perception of their ability to engage in the specified behavior of exercise. These six statements were adapted from Plotnikoff and Higginbotham (2002) and modified toward exercise behavior as it relates to obesity: (1) "I would be able to get adequate exercise even when I

feel a little tired", (2) "I would be able to get adequate exercise even when I have many demands at work/school or have many home duties", (3) "I would be able to get adequate exercise even though I am feeling depressed", (4) "I would be able to get adequate exercise even if I have to do it by myself", (5) "I would be able to get adequate exercise even when I become bored with the activities", (6) "I would be able to get adequate exercise even if I cannot notice improvements in my fitness". Responses ranged from 1 (strongly disagree) to 5 (strongly agree) for all items and were summed to create a total self-efficacy score.

Response costs. Response costs are things that the individuals perceive as "lost" by engaging in the exercise behavior. These four questions were adapted from Milne et al. (2002): (1) "The benefits of getting at least one 20-minute session of vigorous exercise a week outweigh the costs", (2) "Getting at least one 20-minute session of vigorous exercise during the week would cause me too many problems", (3) "I would be discouraged from taking at least one 20-minute session of vigorous exercise each week because I would feel silly doing so", (4) "Regular exercise would take up too much of my time". Items responses ranged from 1 (strongly disagree) to 5 (strongly agree) and were summed to create a total response costs score.

Intervention

The intervention consisted of two parts. Participants in the experimental group engaged in the treatment intervention portion of the study, while participants in the control group engaged in a filler task. The motivational intervention was given after participants completed the Demographics, Prior Physical Activity, and PMT Components measures in Time 1 of the study. The volitional intervention came after the Exercise

Intention measure for the experimental group only (also during Time 1). Individuals in the control group read benign material related to the Student Success Center on campus (see Appendix E).

Motivational intervention (experimental group only). Each PMT variable was manipulated based on factual health information pertaining to the consequences of obesity in the college population and the relation of exercise behavior to obesity. It is noteworthy that in the PMT model, perceived vulnerability and perceived severity contribute to the fear component; therefore there was not a specific *fear* manipulation. Variables were manipulated in a manner similar to Milne et al. (2002). All information included in the manipulation condition was factual based on existing research in the areas of obesity and exercise. Appendix F presents the complete manipulation of all PMT components. After each section, participants were asked to answer two questions in order to ensure they understood the material. Manipulation of each variable was as follows:

Perceived severity. The perceived severity manipulation was meant to state the severity of obesity in general. Several statements were provided to the participants regarding the physical complications due to obesity (e.g., diabetes, heart disease, cancer, high blood pressure, high cholesterol, stroke, breathing problems, arthritis, infertility, and premature death) and social and psychological complications (e.g., depression, anxiety, social isolation, bullying/teasing, job discrimination, low self-esteem, eating disorders, difficulty forming and maintaining relationships, and poor quality of life). Statistical information was also included: (1) women are three times more likely to experience difficulty becoming pregnant and (2) obesity is the 4th leading risk factor for deaths worldwide.

Perceived vulnerability. The perceived vulnerability manipulation provided information on the likelihood of obesity effecting the college aged population, which is the focus of the current study. Statistical information provided was as follows: (1) women ages 20-34 have shown the fastest increases in obesity rates among adults, (2) more than 65% of young men and women are overweight or obese, (3) college students gain an average of 4 pounds in their first year of college, and steady increases in weight are seen from freshman year into adulthood, and (4) most young adults meet at least one criterion for heart disease, stroke, and diabetes.

Maladaptive response rewards. The maladaptive response rewards manipulation emphasized information that allowed participants to see the positive aspects of engaging in exercise versus the negative consequences. Information provided to the participants was as follows: (1) while some people think that avoiding exercise saves energy, in fact, exercising increases energy and helps combat fatigue, (2) while some people think avoiding exercise helps prevent injury, regular exercise can actually strengthen bone and muscle and lead to less risk for injury, and (3) exercise injury can be avoided by slowly introducing your body to exercise, avoiding overtraining/too much exercise, stopping when feeling pain, and exercising in a different way if you do have an injury.

Response efficacy. The response efficacy manipulation was intended to help participants understand the relationship between exercise and its positive effects on obesity reduction and health improvement. Information provided was as follows: (1) anxiety and depression tend to decrease with weight loss through exercise, (2) losing weight through exercise reduces risk for diabetes, heart disease, and stroke, (3) even modest weight loss can improve many of the negative effects of obesity on reproduction,

(4) walking just one extra mile each day can lead to a six pound weight loss per year, and (5) most young adults who stick to exercise find it effective.

Self-efficacy. The self-efficacy manipulation was meant to increase the participants' belief that they can perform exercise. Information was provided in a manner to strengthen participants' perception that they are able to exercise, that it is worth the accomplishment, and that exercise can be simple to achieve. Information provided was as follows: (1) most young adults have the ability to exercise, (2) regular exercise started in college is likely to be maintained throughout the lifespan, (3) if a person doubted their ability to exercise, it would help to imagine themselves doing the exercise, and (4) some simple ways to get exercise: performing jumping jacks or jogging in place during TV commercial breaks; playing Frisbee, tennis, or other activities with friends or family; and walking the dog.

Response costs. The response costs manipulation addresses the perceived costs that may be associated with engaging in exercise. Information was provided to validate such perceptions and provide additional means of thinking about the costs as well as ways of potentially avoiding or minimizing such costs: (1) while exercising has costs, such as taking time out of your day, most young adults find these to be minor and easily overcome and that the benefits outweigh the costs, (2) some ways to overcome costs of exercise include: exercise while watching your favorite TV show, forgoing just 30 minutes of TV time, waking up just 30 minutes earlier, being active with friends, taking active breaks throughout the work day, walking briskly on campus, parking further away, riding bike to class/work, taking advantage of the free gym membership while in school, and (3) benefits of exercise can include: meeting people, improvements in mood, feeling

better, clothes fitting better, and gaining self-confidence – which can make any costs worth the trade-off.

Exercise intention (all participants). To assess participants' intent to exercise in the next two weeks, three items were adapted from Milne et al. (2002; Appendix G). All participants were asked if they intended to exercise during the next two weeks; and if so, how often and how long they intended each exercise session to last. Participants were reminded that exercise sessions must be at least 20 minutes long and must cause a noticeable increase in breathing rate.

Volitional intervention (experimental group only). Participants in the experimental group were asked to form an implementation intention (goal) related to exercise behavior in the upcoming two weeks. This was adapted from Milne et al. (2002) and Zhang and Cooke (2011; see Appendix H). The following statement (adapted from Milne et al., 2002) was presented to participants in the experimental group after they read the informational passage and completed the Exercise Intention Questionnaire: "People often intend to engage in at least one 20-minute session of exercise, but then they forget or 'never get around to it'. It has been found that if you form a definite plan of exactly where and when you will engage in an intended behavior, you are more likely to actually do so. It would be useful for you to plan where and when you will exercise in the next two weeks." Participants in the experimental group were then asked to provide answers to four open ended questions: (1) On what day(s) during the next 2 weeks will you partake in exercise for at least 20 minutes?, (2) At what time will you engage in exercise on these specific days over the next 2 weeks?, (3) What activity will you engage in at these specified times in the next 2 weeks?, and (4) How many times will you engage in

exercise during the next two weeks? The first two questions were used by both Milne, Orbell and Sheeran (2002) and by Zhang and Cooke (2011), while the final two questions were developed for the purpose of the current study.

Time 2 measures. The following questionnaire was given to all participants during Time 2 of the study at the two week follow-up.

Exercise Behavior (5 items). Follow-up questions regarding exercise behavior in the past two weeks included engagement in exercise, number of exercise sessions (both taken from Milne et al., 2002), and typical duration of exercise sessions. To help ensure that the purpose of the Time 2 questionnaire was not obvious, filler questions were added to the Time 2 survey. Filler questions asked about fruit and vegetable consumption, skipping meals, and sleep habits over the past two weeks (difficulty falling asleep, awaking during the night, waking too early, waking unrefreshed, number hours of sleep; see Appendix I for the complete questionnaire).

Procedure

Participants were recruited from undergraduate psychology courses at UND via the department SONA System. Data was collected using the Qualtrics Research Suite via a link to the psychology department's SONA System. Participants were randomly assigned into one of two groups (experimental: receiving the motivational and volitional intervention; or control: receiving no intervention). There were 66 women in the experimental group and 64 women in the control group. Participants accessed the survey via the Psychology department's SONA System. Participants were informed about the purpose of the study (to obtain a better understanding of how college students think about health) and read and completed the informed consent (see Appendix J).

During Time 1, all participants completed measures of demographics, physical activity, and PMT components (in this order). After these measures were completed, participants in the experimental group were presented with the Obesity Information which included factual information concerning the consequences of obesity, how obesity relates to college students, benefits of exercise in combating obesity, and ways of overcoming any costs related to engaging in exercise (see Appendix F). This information was presented in a slide presentation format with six sections of information. After each informational section, participants were asked to answer questions related to the material just read. This was done to ensure participants were reading and comprehending the material. No participants were removed from the study based on their responses. Participants had the opportunity to reverse and re-read the material if they were unable to answer the questions. Individuals in the control group were presented with information regarding services available to students through the UND Student Success Center. The material was presented to them as additional, non-health information related to academic success. (see Appendix E). All participants were then prompted to complete the Exercise Intention Questionnaire, and experimental group participants were asked to provide a specific goal regarding exercise behavior in the next two weeks (how many times and how long each session, see Appendix H). Contact information was collected to facilitate completion of the follow-up data collection session at Time 2 two weeks later. The initial online data collection session took less than 30 minutes.

Time 2 data collection was also completed online. All participants were contacted via email two weeks after their Time 1 participation and were prompted to complete a short Exercise Behavior follow-up measure (Appendix I). This included measures of

physical activity assessing behavior in the past two weeks, along with open-ended questions inquiring about typicality of the previous two weeks and why the participant did not exercise if they had intended to. The follow-up session took approximately 10 minutes. Following the survey, participants viewed a brief statement further explaining the purpose of the study (see Appendix K) and received one point of course credit for their participation.

CHAPTER III

RESULTS

Preliminary Analyses

Descriptive statistics and bivariate correlations for all variables were computed. Descriptive information of demographic variables was previously presented in the Participants section. Participants who completed both Time 1 and Time 2 within the appropriate timeframe did not significantly differ on any of the demographic variables analyzed, as compared to those who only completed Time 1 (BMI: $F(1,227) = 3.52$, $p = .06$; Age: $F(1,228) = .89$, $p = .35$; Race: $F(1,228) = 1.58$, $p = .21$; College: $F(1,228) = .28$, $p = .60$).

Regarding the final sample used in all subsequent analyses, BMI was calculated based on self-reported height and weight: underweight = 8 (6.2%), normal weight = 81 (62.3%), overweight = 26 (20%), and obese = 14 (10.8%). Regarding prior physical activity, most (90% or $n = 117$) of the women in this study exercised at least once in the two weeks prior to the study, while 13 (10%) did not engage in exercise during that timeframe. In total, 106 (81.5%) participants identified that they regularly engage in exercise at least once per week, while 24 (18.5%) participants indicated that they regularly engage in exercise two to three times per month or less. See Table 1 for descriptive statistics of all PMT components. Individuals who completed both Time 1 and Time 2 did not differ on any of the PMT components as compared to those

individuals who did not complete Time 2 (PV: $F(1,225) = 1.82$, $p = .18$; PS: $F(1,225) = 2.53$, $p = .11$; Fear: $F(1,225) = 1.27$, $p = .26$; MRR: $F(1,225) = .26$, $p = .61$, RE: $F(1,223) = .16$, $p = .69$; SE: $F(1,223) = .37$, $p = .54$; RC: $F(1,224) = 2.12$, $p = .15$).

Bivariate correlations among all PMT components, demographic measures, previous physical activity (frequency and duration), exercise intention, and actual exercise (frequency and duration) are shown in Table 2. None of the demographic measures significantly correlated with intent or actual frequency of exercise. Thus, there were no covariates included in the subsequent regression analyses used to assess Hypotheses 2 and 3. However, preliminary findings indicated that although participants were randomly assigned to the treatment or control experimental conditions, these groups significantly differed in perceived weight class. Those in the treatment group viewed themselves as weighing more than the control group did [treatment group: $M = 2.39$, control group: $M = 2.17$; $F(1,128) = 4.20$, $p = .043$]. As such, all subsequent analyses comparing these two groups included perceived weight class as a covariate in order to account for this difference between groups.

Predicting Exercise Intention and Actual Subsequent Exercise

Prior exercise predicting coping and threat appraisals. Bivariate correlations described above were used to assess Hypothesis 1: that higher levels of exercise prior to engaging in the current study should be associated with higher levels of response

efficacy and self-efficacy, and with fewer response costs to engaging in exercise. It was also expected that higher levels of prior exercise would be associated with lower perceived vulnerability, perceived severity, and fear of developing obesity; as well as fewer maladaptive response rewards from not exercising.

As is indicated in Table 2, Hypothesis 1 was only partially supported. That is, both frequency and duration (in minutes) of prior physical activity were only correlated with self-efficacy (frequency: $r = .39$, $p < .01$; duration: $r = .23$, $p < .05$) and response costs (frequency: $r = -.41$, $p < .01$, duration: $r = -.28$, $p < .01$). This suggests that people who engaged in more exercise prior to participating in this study viewed themselves as having more ability to engage in exercise and perceived fewer costs associated with exercising. The correlation between response efficacy and frequency of prior physical activity was marginal ($r = .16$, $p = .09$), suggesting that individuals who engaged in more exercise saw more benefits to exercising than those who engaged in less prior exercise (duration of prior physical activity did not near significance in this case). Correlations with all PMT components were in the same direction yet stronger for frequency of prior physical activity compared to duration of prior physical activity. Therefore, exercise frequency (how many times did the individual exercise) was selected as the index of prior physical activity in all subsequent analyses.

Appraisal components predicting exercise intent. A linear regression model was computed to test Hypothesis 2: that perceived severity, perceived vulnerability, fear, response efficacy, and self-efficacy would predict greater intention to exercise; and maladaptive response rewards and response costs would predict less intent to exercise. Within the regression model, perceived severity, perceived vulnerability, fear, response

efficacy, self-efficacy, maladaptive response rewards and response costs were predictors of intent to exercise in the upcoming two weeks. The overall regression model was significant: R^2 = .27, F(7,112) = 5.79, p < .001; see Table 3) and Hypothesis 2 was partially supported. Greater self-efficacy predicted stronger intent to engage in future exercise (β = .407, p < .001**)**, as did fewer perceived response costs to engaging in exercise (β = -.258, p < .05). There were no other significant predictors of intent.

Appraisal components predicting subsequent exercise. A linear regression model was computed to test Hypothesis 3: that perceived severity, perceived vulnerability, fear, response efficacy, and self-efficacy would predict more frequent subsequent exercise; and maladaptive response rewards and response costs would predict less subsequent exercise. Within the regression model, perceived severity, perceived vulnerability, fear, response efficacy, self-efficacy, maladaptive response rewards and response costs were predictors of frequency of subsequent exercise (at Time 2). The overall regression model was significant: R^2 = .227, F(7,101) = 4.24, p < .001 (see Table 4). Hypothesis 3 was partially supported in that greater self-efficacy marginally predicted more frequent exercise at Time 2 (β = .210, p = .07). Fewer perceived response costs associated with exercising significantly predicted more frequent exercise at Time 2 (β = -.381, p = .001). There were no other significant predictors of exercise at Time 2.

Effects of Intervention on Intent to Exercise and Actual Exercise Behavior

Group differences in exercise intention. A one-way ANCOVA with perceived weight class as a covariate was computed to assess treatment vs. control group differences in intent to exercise. According to Hypothesis 4, individuals in the experimental group who received the informational and volitional treatment components

were expected to display greater intent to exercise than those in the control group. The hypothesis was not supported, with no significant difference between the control (M = 7.53) and treatment groups (M = 7.70) in intention to engage in exercise, $F(2,119) = 0.20$, $p > .05$.

Group differences and changes in exercise. In order to test both Hypotheses 5 and 6, a 2 x 2 repeated measures ANCOVA with Group (treatment vs. control) as the between subjects factor and Time (pre-intervention vs. post-intervention) as the within subjects factor was computed to test both Hypothesis 5 (individuals in the experimental group were expected to exercise more frequently during the two week follow-up period in comparison to individuals in the control group) and Hypothesis 6 (there was predicted to be a significant increase in exercise frequency among the experimental group at the two week follow-up in comparison to the initial assessment). Individual perceived weight class was included as a covariate.

The overall Repeated Measures ANCOVA was non-significant, *Wilks* λ = .981, $F(1,103) = 1.98$, $p = .16$). Although not significant, participants in the treatment group (M = 6.77), as compared to the control group (M = 6.54), reported greater actual exercise at Time 2, suggesting a trend in the expected direction. Participants in the treatment group did not show significant changes in frequency of exercise from Time 1 (M = 7.13) to Time 2 (M = 6.77); nor did the control group (Time 1 M = 6.38, Time 2 M = 6.54).

CHAPTER IV

DISCUSSION

Discovering ways to prevent and combat obesity are essential in addressing the increasing obesity rates in the United States and throughout the world. The current study was conducted to gain a better understanding of factors that contribute to healthy exercise behavior, and in turn, potential reduction in obesity rates. The Protection Motivation Theory (PMT) framework was applied within the context of obesity to predict and assess intent to exercise and actual exercise behavior change among female college students. Notably, exercise intent and actual frequency of exercise behavior did not vary as a function of age, ethnicity, BMI or year in school. The three main objectives were: (1) to examine how prior physical activity predicts coping and threat appraisal components of PMT, (2) to examine each threat and coping appraisal component of the PMT model as predictors of intent to exercise and of actual exercise behavior, and (3) to apply an informational and volitional (goal setting) intervention designed to increase intent to engage in regular exercise, as well as increase frequency of actual exercise behavior. Each of these objectives and their accompanying results are discussed in the following sections.

Prior Exercise Predicting Coping and Threat Appraisals

The first objective was to examine prior physical activity as a predictor of the coping and threat appraisal components of PMT (e.g., does exercise behavior predict perceived vulnerability to obesity?). Higher levels of exercise during the two weeks prior

to participating in Time 1 of the current study were expected to be associated with higher levels of response efficacy and self-efficacy, and with fewer response costs associated with engaging in exercise (coping appraisal process). It was also expected that higher levels of prior exercise would be associated with lower perceived vulnerability, perceived severity, and fear of developing obesity; as well as fewer maladaptive response rewards from not exercising.

The current findings only partially supported these predictions. That is, prior physical activity was only correlated with self-efficacy and response costs, suggesting that women who exercise more frequently perceive themselves as having greater ability to exercise and view fewer costs to be associated with exercise. These findings are consistent with previous research showing that perceptions of exercise self-efficacy and fewer perceived response costs to engaging in exercise are most predictive of current and future exercise behavior (Milne et al., 2000). The correlation between response efficacy and prior physical activity neared significance, suggesting that women who exercise more frequently perceived more benefits to exercise versus those who exercise less often; also supported by existing research (Milne et al., 2000).

It is possible that prior physical activity did not predict other PMT components (perceived vulnerability, perceived severity, fear, and maladaptive response rewards) as expected due to the demographic characteristics of the sample. In particular, young adults tend to view themselves as invulnerable and underestimate their risk of developing certain diseases, such as heart disease and diabetes (Collins, Dantico, Shearer, & Mossman, 2004; Mosca et al., 2000; Ponder, Lee, Green, & Richards, 1996; Wendt, 2005). Moreover, young adults who are already engaging in exercise may see themselves

as even less vulnerable to obesity or health complications associated with obesity; and in the current sample, 90% of individuals identified as exercising at least once in the past two weeks, with 81.5% stating that they regularly exercised at least once every week. The low overall mean for perceived vulnerability (2.26 on a scale with a possible range of 2 through 10) suggests a floor effect on this measure and supports the rationale that the current sample lacked variability on the measure of perceived vulnerability which may contribute to the lack of significant relationships between it and prior exercise, exercise intent, and subsequent exercise.

Appraisal Components Predicting Intent and Subsequent Exercise

The second objective was to examine each threat and coping appraisal component of the PMT model as predictors of intent to exercise and of actual exercise behavior. It was predicted that perceived severity, perceived vulnerability, fear, response efficacy, and self-efficacy would predict greater intention to exercise and more frequent actual exercise in the subsequent two weeks; while maladaptive response rewards and response costs would predict less intent to exercise and less frequent actual exercise. The findings partially supported these expectations, with greater self-efficacy and fewer perceived response costs predicting greater intent to exercise and more frequent actual exercise in the subsequent two weeks.

Together, these findings suggest that women who view themselves as more able to engage in exercise, and associate fewer costs with engaging in exercise, are more likely to plan for exercise and actually engage in exercise. This follows previous research showing that greater exercise self-efficacy and fewer perceived response costs attributed

to engaging in exercise are most predictive of current and future exercise behavior (Milne et al., 2000).

These results suggest that making exercise easy for individuals to engage in is key to encouraging exercise behavior. Identifying ways to convince people that they can successfully engage in exercise and ensuring low personal cost for engaging in exercise may be beneficial in creating health promotion campaigns that work to increase exercise behavior.

Perceived costs to engaging in exercise may be loss of time to accomplish daily tasks, less time for socialization with peers, fear of embarrassment due to engaging in exercise, fatigue, and pain associated with exercise. Future campaigns should specifically address these perceived costs associated with exercise by countering them with positive information. An example would be helping individuals understand that loss of time is actually minimal (such as merely 30 minutes per day) and may lead to improved memory and overall cognitive functioning (Davis et al., 2011; Dik, Deeg, Visser, & Jonker, 2003; Hopkins, Davis, Vantieghem, Whalen, & Bucci, 2012) as well as decreased stress (Plante et al., 2011); which may in turn lead to better efficiency in completing daily tasks, making a small loss of time beneficial overall. Additionally, the short-term loss of time is essentially "given back" to the individual in the long-term, as moderate levels of physical activity have been shown to increase life expectancy by as much as 4.5 years (Moore et al., 2012). Addressing perceived costs of pain and fatigue associated with exercise may be done through promoting learning of proper technique and form, and understanding that adequate exercise can be achieved with just 150 minutes of moderate or 75 minutes

of intense physical exercise each week and can be broken into various 10-minute exercise sessions (CDC, 2011b; WHO, 2011b).

The perceived cost of fear of embarrassment associated with exercise may be addressed partially through increasing self-efficacy associated with exercise. This can include understanding that adequate exercise can be performed in minimal time and by providing ideas for easy opportunities to achieve exercise. For example, the current study suggested performing jumping jacks or jogging in place during TV commercial breaks, playing Frisbee, tennis, or other activities with friends or family (thereby also promoting increased socialization with activity), or walking the dog. Interventions increasing self-efficacy through providing information and improving self-regulation, such as goal setting, have been found to increase exercise as well as improve nutrition intake (Annesi, 2011). Perceived vulnerability, the perception of personal risk from obesity, has also been shown to predict future exercise behavior (Milne et al., 2000), but was non-significant in the current study. In general, if individuals do not perceive themselves as vulnerable to the risks associated with obesity, they may be less likely to engage in exercise as a means to combat the negative effects. Due to the current sample being largely composed of already healthy and active individuals, future exercise behavior may not have changed based on perception of vulnerability due to the women already engaging in frequent exercise and simply no significant change in exercise behavior overall.

Likewise, it is possible that young adults, in addition to perceiving low personal risk for such disease, may misperceive the severity of risk associated with obesity; and as such have low overall fear associated with obesity risk. Future health campaigns may

benefit from providing health education related to the various risks associated with obesity, even in young adulthood.

Young college students may also be more inclined to seek the benefits of not exercising (maladaptive response rewards) such as wanting more time for socialization and adjusting to more hectic schedules associated with their increase in independence and college course work. Again, health education may be beneficial to provide counter-arguments to the reasons individuals may view as benefits to not exercising. For example, the current study countered the belief that avoiding exercise saves energy, by providing information that exercise actually increases energy and helps combat fatigue. Likewise, regarding concern regarding exercise injuries, the current study countered negative beliefs by providing information regarding less risk of injury with bone and muscle strengthening and ways to introduce exercise slowly and carefully. Future health campaigns may benefit from including similar information, which would likely enhance self-efficacy in addition to reducing perceived maladaptive response rewards.

Effects of Intervention on Intent to Exercise and Actual Exercise Behavior

The third objective was to apply an informational and volitional (goal setting) intervention intended to increase intent to engage in regular exercise, as well as increase frequency of actual exercise behavior. The current findings indicated the intervention was not effective in that there were no significant differences between the control and treatment groups in intention to engage in exercise or in actual frequency of subsequent exercise behavior. There was also no significant difference among the treatment group in amount of exercise between Time 1 and Time 2.

The experimental manipulation portion of the current study was adapted from Milne et al. (2002) which provided a similar intervention with significant change in exercise behavior at follow-up. Different from the current study, Milne et al. engaged their participants in two follow-up sessions at one and two weeks from the initial data collection session. At the one week follow-up, individuals in the Milne study were again provided with the informational treatment component and the volitional treatment (goal-setting) component was added. While there was no significant change in behavior at the one-week follow-up (after receiving the informational component and completing the PMT component questionnaire during the initial session), there was significant change in exercise behavior among treatment group participants at the two-week follow-up. Results obtained in the current study may have differed from those of Milne et al. in that the informational component in the Milne et al. study was given twice during two separate sessions, and the volitional component was added after participants had one week to process the information provided in the initial session. Future studies may benefit from teasing apart the time-spacing of the two components versus simply providing the information more than once (even assessing the effect of providing it multiple times).

Current results suggest that the treatment component used in this study was not effective in producing behavior change. Actual and lasting behavior change has been shown to be hard to achieve (Emery, Szczypka, Powell, & Chaloupka, 2007), yet understanding how to change and increase exercise behavior is tremendously important in combating rising obesity levels. Previous research has shown that higher response efficacy of exercise (personal benefits of the exercise behavior) and higher self-efficacy (perception that one can engage in exercise behavior) are the PMT components that best

predict actual behavior change, with self-efficacy being most predictive (Milne et al., 2000). The current results, in conjunction with previous research, suggest that targeting self-efficacy, response efficacy, and response costs (especially self-efficacy) when promoting healthy behavior are key.

Limitations and Future Research

Identifying which PMT components lead to exercise behavior leaves room for future research to evaluate the best ways to relay this information to the public. One limitation to the treatment component in the current study may have been that the information was provided only one time and was rather brief. In contrast, the Milne et al. (2002) study, provided the informational component on more than one occasion and achieved significant results. Likewise, Annesi (2011) provided multiple face-to-face informational sessions and achieved significant behavior change. Future research should work to tease apart the importance of increased frequency of exposure to health promotion information and the best method of exposure.

Expanding on the online format used in the current study, it would be interesting to rerun the study providing the treatment information on more than one occasion, such as through a weekly email reminding participants to log into the study online or by providing information within the email body. This would be an easily accessible means of getting information to participants, would allow for presentation of a larger variety of information, and behavior change follow-up could continue through periodic evaluation of exercise status. Future studies should evaluate various methods, including face-to-face, online, email, telephone, etc. to see which method is the easiest to use for relaying information and has the largest impact on individual behavior change.

Youth exercise campaigns are becoming more prevalent (CDC, 2010c) and this may be an important time to begin introducing health concepts to show that exercise can be fun and easy, and the results so highly beneficial (such as improvements in physical and psychological health and social well-being). If such information were made more prevalent within schools, this information would be given at a much higher frequency and may be more impactful. By targeting individuals at the college level, lifelong sedentary behavior and poor health habits may already be highly learned and more difficult to change. Beginning healthy nutrition and exercise habits during youth have been shown to lead to lasting healthy behavior into adulthood, therefore starting young may be the best way to ensure lower future rates of obesity (APA, 2013). Although we hope to change the state of our current obesity rates, starting young may ensure that these rates naturally decline over time; while we continue to promote behavior change to individuals at the adult age level.

At the college level then, campaigns can work to encourage a continuation of healthy habits so that those who were active in high school continue healthy activity in college. Many colleges offer free gym memberships to students, and widely promoting this across campus may help students be aware of such services. Making campuses more walking/biking friendly may provide additional ease of achieving physical activity (MacDonald et al., 2010; WHO, 2011b). Eliciting environmental changes across cities and campuses may promote self-efficacy and lower response costs, and may include making cities walking/biking friendly, lowering costs of gym memberships, insurance companies widely promoting health club discounts, and businesses offering longer lunch periods and/or gyms on the employment campus. It is exciting to note the physical and

psychological health and sociological benefits that occur through exercise and weight loss, and by cities, governments, businesses, and schools promoting positive health behavior and making it easier to accomplish, obesity rates will lower; which will in turn lead to fewer health complications (Hansen et al., 2010), lower health care costs and costs to insurance companies, ensure less absences from work and school (CDC, 2010b; Finkelstein et al., 2003), and provide an overall increase in physical and psychological health (Luppino et al., 2010), among many other potential benefits.

Because women are experiencing increases in obesity rates at a faster rate than men (CDC, 2010d), focusing specifically on this group may be important. One reason that women may be increasing obesity at a higher rate may be due to pregnancy. It may be beneficial to develop and increase programs specific to promoting weight loss after pregnancy. Many health clubs help make this possible by offering free childcare during a workout session, and it may be helpful to promote this further. Physicians and clinics may want to provide more information on ways to achieve weight loss after pregnancy. Overall, it seems that campaigns must help individuals see that they are able to exercise, that the benefits to exercise are great, and that the costs to exercise is minimal.

It is noteworthy when considering results analysis for the current study that participant weight classification did not match the typical nationwide sample, with 62.3% of participants indicating a healthy weight (normal weight BMI), 20% overweight, and 10.8% overweight. Nationwide just 33.2% of women are considered to be of a healthy weight, while 64.5% of women are considered overweight or obese, with 35.9% being classified as obese (CDC, 2010d). Specific to the nationwide rates for women age 20-44, 38.2% are considered to have a healthy weight, 25.8% are classified as overweight,

33.2% as obese, and 7.6% as severely obese (CDC, 2010d). Likewise, 90% of the current sample identified as exercising at least once in the past two weeks, with 81.5% stating that they regularly exercised at least once every week; while nationwide rates suggest that only roughly 70% of individuals identify as being at least somewhat active, with 31% of individuals worldwide estimated to be inactive (WHO, 2011b).

With much of the current sample already engaging in exercise, there may have left little room for exercise behavior change. It may be beneficial to test the same or a similar treatment paradigm in a non-active sample to see if behavior change ensues. The high number of exercisers in the sample may have also contributed to low between group differences, such as the demographic variables assessed, and therefore assessing the between group differences in intent and actual exercise may be interesting in a less active or non-active sample. Although only women were used in the current sample due to their unique risks for obesity and obesity complications, it would be interesting to run a similar study with men and to evaluate any gender differences in results.

The self-report data used in this study was an additional limitation, as the current study relied on honesty and self-knowledge in the data and subsequent results analysis. Following actual behavior and obtaining accurate height and weight data may lead to a difference in results. The online nature of the data collection was another potential limitation, as participant engagement in the study could not be encouraged or evaluated.

CHAPTER V

CONCLUSION

Protection Motivation Theory rests on the belief that people are motivated toward health protective behaviors based on a perception of, and effort to avoid, a negative health outcome (Kohler, Grimley, & Reynolds, 1999). This theory has been evaluated within the realm of numerous healthy behaviors and has been shown to have an overall moderate effect size, with good support for the model (Floyd et al., 2000). With obesity rates on the rise, understanding motivation toward healthy exercise behavior is important so that more people can be motivated to engage in exercise, therefore reducing obesity levels on the whole; as thus far, public health promotion campaigns have showed minimal lasting behavior change (Emery, Szczypka, Powell, & Chaloupka, 2007). Addressing young adult female health is especially important due to increased risk for fertility and pregnancy complications associated with obesity (Gesink-Law, Maclehose, & Longnecker, 2007; Purcell & Moley, 2011). Prior to the current study, PMT has not been evaluated in the context of obesity prevention or with including all components of the PMT model. The current study was intended to identify specific predictors of exercise as engaged in for obesity prevention.

As would be expected, those individuals who engaged in exercise prior to participating in the study viewed themselves as more able to exercise and perceived less cost to exercise. The self-efficacy and response costs components of the PMT model

were predictive of both intent to engage in exercise and actual exercise behavior at Time 2, suggesting that an individual who believes they are able to exercise and perceives fewer costs to exercise will be more likely to plan for and actually engage in exercise behavior.

Overall, the treatment component in the current study was found to be ineffective. Those individuals in the treatment group did not show greater intent to exercise or exhibit more exercise at Time 2. Likewise, there was not a significant difference between the treatment and control groups in amount of exercise at Time 2. Although non-significant, the treatment group exhibited change in the expected direction, with slightly higher exercise amounts reported versus those in the control group. Milne et al. (2002) achieved success with behavior change by providing the informational treatment component on more than one occasion and by providing the volitional intervention at follow-up rather than with the initial presentation of the informational component.

Future health promotion campaigns may achieve improved success with lasting behavior change by specifically addressing enhancements in self-efficacy and by providing counter arguments to perceptions regarding negative consequences to engaging in exercise. It may be additionally important to specifically address the risks of obesity associated with even the young adult population, along with the benefits that exercise can provide in reducing the risks associated with obesity. This is especially true for young adult females who may not recognize the fertility and pregnancy risks associated with obesity. Improvements in obesity rates in this population will lead to better physical and psychological health and well-being, improvements in socialization, and habits learned in early adulthood will be more likely to continue into later adulthood

APPENDICES

Appendix A
SONA Study Description

The purpose of this online study is to gain a better understanding of health knowledge in college students, particularly health knowledge related to obesity and exercise. Having such an understanding may lead to ways to better promote exercise in an effort toward obesity prevention.

Your participation in the study will include two parts: Part 1 will be completed now and you will be contacted to complete Part 2 in two weeks. You will need to log onto SONA System on two separate occasions to complete the online surveys. Two weeks from today, you will receive an email reminding you to log into SONA System and complete Part 2 of the study. The first session is expected to take less than 30 minutes. During this time you will be asked to answer questions and read a short passage. Two weeks later you will log on to answer a few brief questions. This second session is expected to take less than 30 minutes.

It is expected that there will be minimal risk from being in this study. You may experience some negative feelings when reading the information related to obesity and exercise. Should you become upset at any point in the study, you may stop at any time or choose not to answer a question.

If you would like to participate in this study, please click on the following link:

If you would like further information about this study before deciding whether to participate, feel free to contact the project advisor: Dr. Joelle Ruthig at joelle.ruthig@email.und.edu or 777-3533.

Appendix B
Demographics

Before you begin Part 1 of the study, begin by entering your "special" 10-digit number in the following box. Your 10-digit number consists of: your 6-digit date of birth (mm/dd/yy) + last 4 digits of your student id number (e.g., if your birthday is June 8, 1987 and your student id is 0756857 then your special number would be 0608876857). Your special number will be used for the purpose of merging your responses from Part 1 of the study with Part 2 of the study that you will complete in 2 weeks. Your 10-digit number: ----------

1. Current Weight (in pounds):_____

2. Height:_____

3. Gender: What is your sex?

a. Male b. Female

4. What is your Age? _____

5. Please specify your race/ethnicity:

a. American Indian or Alaska Native
b. Hispanic or Latino
c. Asian
d. Black or African American
e. Native Hawaiian or Other Pacific Islander
f. White
g. Other _____

6. What year are you in school?

a. Freshman
b. Sophomore
c. Junior
d. Senior

Appendix C
Prior Physical Activity

The following questions are to assess how often you exercise. Exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports that are completed for at least 20 minutes each time.

An exercise session that is 20 minutes or longer counts as one session.

1. Using the above definition of exercise, in general, how often do you **TYPICALLY** engage in exercise?

Less than once per month Once per month 2-3 times per month

Once per week 2-3 times per week 4 or more times per week

2. Using the above definition of exercise, did you engage in exercise (for at least 20 minutes) in the past **2 WEEKS**?

YES NO

3. If YES, how many times did you engage in exercise in the past **2 WEEKS** (again using the above definition of exercise)?

_____Times

4. Using the above definition of exercise, ON AVERAGE, how many **minutes** did you exercise per session during the past **2 WEEKS?**

   _____ minutes

5. Using the above definition of exercise how many **minutes** IN TOTAL did you exercise during the past **2 WEEKS?**

_____total **minutes**

Appendix D
PMT Components

Obesity is a medical condition in which excess body fat has built up to the extent that it may have harmful health effects on the body. This questionnaire asks about your opinion regarding obesity and exercise.

1. How would you describe yourself?

1	2	3	4
Underweight	Normal weight	Overweight	Obese

Measures of Perceived Vulnerability:

2. My chances of becoming obese (or remaining obese) in the future are:

1	2	3	4	5
Not at all				Very much so

3. I am unlikely to develop obesity (or remain obese) in the future:

1	2	3	4	5
Strongly Disagree				Strongly Agree

Measures of Perceived Severity:

4. How serious of a health problem is obesity?

1	2	3	4	5
Not at all serious				Very Serious

5. Obesity can lead to diabetes, heart disease and stroke, and infertility:

1	2	3	4	5
Strongly Disagree				Strongly Agree

6. How much will obesity interfere with someone leading a normal life?

1 2 3 4 5
Not at all Very much so

7. If left untreated, obesity can lead to depression and anxiety, social isolation, and poor quality of life:

1 2 3 4 5
Strongly Disagree Strongly Agree

8. Untreated, obesity can contribute to premature death

1 2 3 4 5
Strongly Disagree Strongly Agree

Measures of Fear:

9. The thought of developing obesity (or remaining obese) makes me feel frightened:

1 2 3 4 5
Not at all Very much so

10. The thought of developing obesity (or remaining obese) makes me feel anxious:

1 2 3 4 5
Not at all Very much so

11. The thought of developing obesity (or remaining obese) makes me feel worried:

1 2 3 4 5
Not at all Very much so

12. The thought of developing obesity (or remaining obese) makes me feel scared:

1 2 3 4 5
Not at all Very much so

Measures of Maladaptive Response Rewards:

13. Being physically **inactive** allows me to conserve energy

1	2	3	4	5
Strongly Disagree				Strongly Agree

14. Being physically **inactive** allows me to save time for doing other things that I enjoy

1	2	3	4	5
Strongly Disagree				Strongly Agree

15. Being physically **inactive** helps me ensure that I won't strain, injure, or overexert myself

1	2	3	4	5
Strongly Disagree				Strongly Agree

Measures of Response Efficacy:

Reminder: Exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports that are completed for at least 20 minutes each time. Please keep this definition of exercise in mind while responding to the following questions:

16. If I were to exercise regularly for at least 20 minutes each week I would reduce my chances of developing obesity (or remaining obese)

1	2	3	4	5
Strongly Disagree				Strongly Agree

17. Regular exercise would improve my chances of living longer

1	2	3	4	5
Strongly Disagree				Strongly Agree

18. I would feel more confident about my health by getting regular exercise

1	2	3	4	5

Strongly Disagree Strongly Agree

19. I would feel more socially confident by getting regular exercise

1 2 3 4 5
Strongly Disagree Strongly Agree

20. Getting regular exercise would help me have a more positive outlook

1 2 3 4 5
Strongly Disagree Strongly Agree

21. Regular exercise would help me control my weight

1 2 3 4 5
Strongly Disagree Strongly Agree

22. Regular exercise would improve my overall health

1 2 3 4 5
Strongly Disagree Strongly Agree

23. Regular exercise would help me to make more friends

1 2 3 4 5
Strongly Disagree Strongly Agree

24. Regular exercise would reduce the health risks associated with obesity

1 2 3 4 5
Strongly Disagree Strongly Agree

25. Regular exercise would provide me with a better quality of life

1 2 3 4 5
Strongly Disagree Strongly Agree

Measures of Self-Efficacy:

Reminder: Exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports that are completed for at least 20 minutes each time

26. I would be able to get adequate exercise even when I feel a little tired

1	2	3	4	5
Strongly Disagree				Strongly Agree

27. I would be able to get adequate exercise even when I have many demands at work/school or have many home duties

1	2	3	4	5
Strongly Disagree				Strongly Agree

28. I would be able to get adequate exercise even though I am feeling depressed

1	2	3	4	5
Strongly Disagree				Strongly Agree

29. I would be able to get adequate exercise even if I have to do it by myself

1	2	3	4	5
Strongly Disagree				Strongly Agree

30. I would be able to get adequate exercise even when I become bored with the activities

1	2	3	4	5
Strongly Disagree				Strongly Agree

31. I would be able to get adequate exercise even if I cannot notice improvements in my fitness

1	2	3	4	5
Strongly Disagree				Strongly Agree

Measures of Response Costs:

Reminder: Exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports that are completed for at least 20 minutes each time

32. The benefits of getting at least one 20-minute session of exercise per week outweigh the costs

1	2	3	4	5
Strongly Disagree				Strongly Agree

33. Getting at least one 20-minute session of exercise during the week would cause me too many problems

1	2	3	4	5
Strongly Disagree				Strongly Agree

34. I would be discouraged from engaging in at least one 20-minute session of exercise each week because I would feel silly doing so

1	2	3	4	5
Strongly Disagree				Strongly Agree

35. Regular exercise would take up too much of my time

1	2	3	4	5
Strongly Disagree				Strongly Agree

Appendix E
Control Group Reading Passage

Aside from health, another issue relevant to students is academic success. The Student Success Center provides programs and services to students to aid in the development and implementation of their educational plans and goals. Through the Center's programs and services, students are empowered to develop the skills and abilities to make a positive adjustment within the campus community.

- **The Student Success Center** focuses on three areas – advising, learning services, and programming
- **Advising** – The Student Success Center provides quality academic advising for all undergraduate students deciding on a major – new freshmen, transfer, current, and re-entering students. Professional advisors provide academic and referral services to students until a major is declared
- **Learning Services** – Services and instruction are provided to assist students in successful academic achievement. These services include: drop-in tutoring, student success classes, and individual assistance and assessments for students with academic concerns

Programming – The Student Success Center provides a variety of programs designed to enhance student success from entrance to the University and throughout a student's undergraduate experience. These programs include: Freshman and Transfer Getting Started (early registration programs), Keep Going (an academic advising informational session to help facilitate the transition for new students from the first to second semester), Staying on Track, and Adult Re-entry peer mentoring sessions.

Appendix F
Obesity

Obesity is a medical condition in which excess body fat has built up to the extent that it may have harmful health effects on the body.

The following information is related to obesity. Please read each statement carefully. After reading each statement you will be asked to answer two questions to ensure you have understood the material.

Section 1 (Perceived Severity Manipulation):

- Obesity can lead to diabetes, heart disease, cancer, high blood pressure, high cholesterol, stroke, breathing problems, arthritis, infertility, and premature death
- Obesity can lead to depression, anxiety, social isolation, bullying/teasing, job discrimination, low self-esteem, eating disorders, difficulty forming and maintaining relationships, and poor quality of life
- Obese women are 3 times more likely to experience difficulty becoming pregnant
- When pregnancy does occur, obese women are at increased risk for miscarriage, pregnancy complications, and birth defects in the infant
- Obesity is the 4th leading risk factor for deaths worldwide

Section 1 Check:

1. Obesity cannot lead to pregnancy complications? True/False
2. Obesity can lead to social isolation? True/False

Section 2 (Perceived Vulnerability Manipulation):

- Women ages 20-34 have shown the fastest increases in obesity rates among adults
- More than 65% of young women are overweight or obese
- College students gain an average of 4 pounds in their first year of college, and steady increases in weight are seen from freshman year into adulthood
- Most young adults meet at least one criterion for heart disease, stroke, and diabetes

Section 2 Check:

1. Young adults have low levels of overweight and obesity True/False
2. Many young adults gain weight in college and continue to gain throughout adulthood True/False

Section 3 (Response Efficacy Manipulation):

- Losing weight through exercise reduces anxiety and depression
- Losing weight through exercise reduces risk for diabetes, heart disease, and stroke
- Even modest weight loss can improve many of the negative effects of obesity on reproduction
- Walking just one extra mile each day can lead to a 6 pound weight loss per year
- Most young adults who stick to exercise find it effective

Section 3 Check:

1. Exercise cannot lead to health improvement True/False
2. Exercise cannot reduce levels of depression True/False

Section 4 (Self-efficacy Manipulation):

- Most young adults have the ability to exercise
- Regular exercise started in college is likely to be maintained throughout the lifespan
- If a person doubted their ability to exercise, it would be helpful to imagine themselves doing the exercise
- Some simple ways to get exercise: performing jumping jacks or jogging in place during TV commercial breaks; playing Frisbee, tennis, or other activities with friends or family; and walking the dog.

Section 4 Check:

1. Most young adults have the ability to exercise True/False
2. People who exercise during college are more likely to exercise throughout adulthood True/False

Section 5 (Response Costs Manipulation):

- While exercising has costs, such as taking time out of your day, most young adults find these to be minor and easily overcome and that the benefits outweigh the costs
- Some ways to overcome costs of exercise include: exercise while watching your favorite TV show, giving up just 30 minutes of TV time, waking up just 30 minutes earlier, being active with friends, taking active breaks throughout the work day, walking briskly on campus, parking further away, riding bike to class/work, taking advantage of the free gym membership while in college

- Benefits of exercise can include: meeting people, improvements in mood, feeling better, clothes fitting better, and gaining self-confidence – which can make any costs worth the trade-off

Section 5 check:

1. Most young adults do not find the benefits of exercise to outweigh the costs True/False
2. I can get exercise in my day by parking farther away and walking briskly to class/work True/False

Section 6 (Maladaptive Response Rewards Manipulation):

- While some people think that avoiding exercise saves energy, in fact, exercising increases energy and helps combat fatigue
- While some people think avoiding exercise helps prevent injury, regular exercise can actually strengthen bone and muscle and lead to less risk for injury
- Exercise injury can be avoided by slowly introducing your body to exercise, avoiding overtraining/too much exercise, stopping when feeling pain, and exercising in a different way if you do have an injury

Section 6 Check:

1. Exercise increases energy True/False
2. Exercise can strengthen bone and muscle and lead to less injury True/False

Appendix G
Exercise Intention

The following questions are to assess how many times you <u>intend to</u> engage in exercise. Remember, exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports that are completed for at least 20 minutes each time. An exercise session that is 20 minutes or longer counts as one session.

1. Using the above definition of exercise, do you intend to engage in exercise for at least 20 minutes in the next **2 WEEKS**?

   YES NO

2. If YES, **HOW MANY TIMES** do you intend to engage in exercise in the next **2 WEEKS?**

   _____ **times**

3. For **HOW LONG (minutes)** do you intend each exercise session to last?

   _____ **minutes**

4. How many **TOTAL MINUTES** do you intend to exercise in the next **2 WEEKS**?

   _____ **minutes**

5. If you **DO NOT** intend to engage in exercise in the next **2 WEEKS**, why not?

   _____

   _____

   _____

Appendix H
Exercise Goals

People often intend to engage in at least one 20-minute session of exercise, but then they forget or 'never get around to it'. It has been found that if you form a definite plan of exactly where and when you will engage in an intended behavior, you are more likely to actually do so. It would be useful for you to plan where and when you will exercise in the next two weeks.

1. On what **DAY(S)** during the next **2 WEEKS** will you partake in exercise for at least 20 minutes?

   _____

   _____

   _____

2. At what **TIME** will you engage in exercise on these specific days over the next **2 WEEKS?**

   _____

   _____

   _____

   _____

   _____

   _____

3. What exercise **ACTIVITY** will you engage in at these specified times in the next **2 WEEKS?**

_____

_____

_____

4. How **MANY TIMES** will you engage in exercise in the next **2 WEEKS?**

_____

Appendix I
Health Behavior (Time 2)

Before you begin Part 2 of the study, begin by entering your "special" 10-digit number in the following box. Your 10-digit number consists of: your 6-digit date of birth (mm/dd/yy) + last 4 digits of your student id number (e.g., if your birthday is June 8, 1987 and your student id is 0756857 then your special number would be 0608876857). Your special number will be used for the purpose of merging your responses from Part 1 of the study that you completed 2 weeks ago with Part 2 of the study that you will complete now.
Your 10-digit number: ----------

The following questions are to assess health behavior over the past 2 weeks.

Exercise includes activities that make you breathe harder, such as brisk walking, bicycling, swimming or playing sports, that are completed for at least 20 minutes each time. An exercise session that is 20 minutes or longer counts as one session.

1. Using the above definition of exercise, did you engage in exercise for at least 20 minutes in the past **2 WEEKS**?

   YES NO

2. If YES, how many **TIMES** did you engage in exercise in the past **2 WEEKS?**

   _____

3. On average, how many **MINUTES** did you exercise per session during the past **2 WEEKS?**

   _____ **minutes**

4. How many **TOTAL MINUTES** did you exercise during the past **2 WEEKS?**

   _____ **minutes**

5. If you intended to exercise in the past two weeks but **DID NOT, WHY NOT**?

_____

_____

_____

_____

6. Were the past 2 weeks typical for you? (Circle One)

YES NO

7. If the past 2 weeks were not typical for you, please explain why.

_____

_____

_____

_____

8. In the **PAST 2 WEEKS**, how often did you skip a meal? (Circle One)

1	2	3	4	5
Never	Seldom	Sometimes	Often	Daily

9. On **AVERAGE** over the **PAST 2 WEEKS**, how many fruit servings did you have **PER DAY**?

None	1	2	3	4 or more

10. On **AVERAGE** over the **PAST 2 WEEKS**, how many vegetable servings did you have **PER DAY**?

None 1 2 3 4 or more

11. In the **PAST 2 WEEKS**, how often did you have difficulty falling asleep? (Cirlce One)

1 2 3 4

Every night Several nights A few nights Rarely or not at all

12. In the **PAST 2 WEEKS**, how often did you awake a lot during the night? (Circle One)

1 2 3 4

Every night Several nights A few nights Rarely or not at all

13. In the **PAST 2 WEEKS**, how often did you wake up too early without being able to get back to sleep? (Circle One)

1 2 3 4

Every night Several nights A few nights Rarely or not at all

14. In the **PAST 2 WEEKS**, how often did you wake up feeling unrefreshed? (Circle One)

1 2 3 4

Every night Several nights A few nights Rarely or not at all

15. On **AVERAGE** over the past **2 WEEKS**, how many **HOURS** did you sleep per night?

_____ hours

Appendix J
Informed Consent

TITLE:	*College Student Health and Health Behaviors*
PROJECT DIRECTOR:	*Kylee J. Heston, M.A.*
PHONE #:	(701) 777-3533
DEPARTMENT:	*Department of Psychology*

A person who is to participate in research must give his or her informed consent to such participation. This consent must be based on an understanding of the nature and risks of the research. This document provides information that is important for this understanding. Research projects include only subjects who choose to take part. Please take your time in making your decision as to whether to participate.

You are invited to participate in a study that examines how female college students think about their health. You are being asked to participate in this study because you are a female student who is taking a psychology course through the Department of Psychology at the University of North Dakota. The purpose of this research study is to gain a better understanding of female college students' perceptions of obesity and exercise.

Approximately 128 female undergraduate students will take part in this online study at the University of North Dakota via the psychology department SONA System.

Your participation in the study will include two parts: Part 1 will be completed now and you will be contacted to complete Part 2 in two weeks. Two weeks from today, you will receive an email reminding you to log into SONA System and complete Part 2 of the study. The first session is expected to take less than 30 minutes. During this time you will be asked to answer questions and read a short passage. Two weeks later you will log on to answer a few brief questions. This second session is expected to take less than 30 minutes.

As a participant, you will be asked to answer various questions related to obesity and exercise. Only the researchers will have access to the information collected and your name will not be on the questionnaires you complete. You are free to skip any questions throughout the session that you would prefer not to answer. Although you are under no obligation, it is essential to the success of this research project that you participate in BOTH parts of the study.

It is expected that there will be minimal risk from being in this study. You may experience some negative feelings when reading the information related to obesity and exercise. If you would like to talk to someone about your feelings about the study, you may contact UND's Student Counseling Center at (701) 777-2127.

You may benefit from being in this study in terms of better understanding how you think about your own health and health behaviors.

If you choose not to participate in this study, you may earn extra credit in your course in other ways. Please ask your instructor, who will provide you with comparable assignments that you may choose to complete (e.g. writing assignments, participation in other research experiments etc.). You will not have any costs for being in this research study. You will receive compensation for participating in BOTH parts of this study in the form of 1 hour extra credit toward your Introduction to Psychology course (1/2 hour of extra credit for each part of the study). The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

You will not have any costs for being in this research study.

The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by Government agencies, the UND Research Development and Compliance office, and the University of North Dakota Institutional Review Board. Any information that is obtained in this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by storing your consent form and identifying information in a separate password protected file from where your responses will be kept. People analyzing the data will not have access to your personal identifying information. If we write a report or article about this study, we will describe the results in a summarized manner so that you cannot be identified.

If you are willing to participate in the study, you will be asked to provide a 10-digit "special number" on the survey that the researcher will use to match your responses from today with your responses in Part 2 of this study. The special number will be used for this matching purpose only and provides no way of identifying who you are. You will also be asked to provide your contact information below so that we may contact you to complete Part 2 of the study. This contact information will be stored separately from your responses in the study.

Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the University of North Dakota.

The researchers conducting this study are Kylee J. Heston, M.A. and Joelle C. Ruthig, Ph.D. If you have questions, concerns, or complaints about the research please contact (701) 777-3533.

If you have questions regarding your rights as a research subject, or if you have any concerns or complaints about the research, you may contact the University of North

Dakota Institutional Review Board at (701) 777-4279. Please call this number if you cannot reach research staff, or you wish to talk with someone else.

Checking this box indicates your informed consent and willingness to take part in this study: _____

Please provide your first name, email address, and a phone number below that can be used for the purpose of contacting you to complete Part 2 of the study in 2 weeks. This contact information will be stored separately from your responses in the study:

First Name: _____

Email: _____

Phone: _____

Appendix I
Debriefing Statement

You have just participated in a study that examines how female college students think about their health. The information you have provided will be used to better understand the relationship between viewpoints on obesity and individual exercise behavior. The researchers hope to better understand if thoughts about obesity change the amount of exercise people engage in, and if people who exercise already have similar thoughts about obesity.

If you experienced any negative feelings from participating in this study, you may want to contact UND's Student Counseling Center at (701) 777-2127.

If you have additional questions, concerns, or complaints about the research, please contact (701) 777-3533.

Table 1

Descriptive Statistics of PMT Variables

Variable	Mean	SD	Range	Possible Range	Reliability
Perceived Vulnerability	4.52	1.05	2-10	2-10	$r = 0.58$
Perceived Severity	22.35	0.56	10-25	5-25	$\alpha = 0.81$
Fear	15.76	1.15	4-20	4-20	$\alpha = 0.95$
Maladaptive Res. Rew	5.55	0.83	3-15	3-15	$\alpha = 0.74$
Response Efficacy	48.70	0.55	30-50	10-50	$\alpha = 0.86$
Self-Efficacy	22.56	0.79	6-30	6-30	$\alpha = 0.88$
Response Costs	4.68	0.65	4-16	4-16	$\alpha = 0.60$

Note: Res. Rew. = Response Rewards

Table 2

Bivariate Correlations

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. BMI	-	.21*	.05	.79*	-.08	-.01	.45*	.03	.18*	.08	-.05	-.14	.14	-.14	-.12	-.06	-.21*
2. Age	.21*	-	.42**	.19*	.02	-.11	-.02	-.02	.02	-.07	-.04	-.01	.04	-.05	-.14	-.06	-.14
3. Class	.05	.42**	-	.02	-.09	-.12	.05	-.02	-.06	.01	-.07	.03	-.03	-.14	-.10	-.16	-.10
4. Perceived Weight	.79*	.19*	.02	-	-.15	-.13	.40**	.14	.19*	.19*	.12	.01	.15	-.10	-.21	-.17	-.27**
5. Prior Frequency	-.08	.02	-.09	-.15	-	.58	-.09	.08	.14	-.10	.16	.39**	-.41**	.84**	.60*	.85**	.46**
6. Prior Minutes	-.01	-.11	-.12	-.13	.58	-	-.04	.02	.10	-.15	.06	.29*	-.28**	.52**	.92**	.53**	.78**
7. Perceived Vuln.	.45**	-.02	.05	.40**	-.09	-.04	-	.01	.28**	.30**	.02	-.06	.13	-.10	-.07	-.07	-.14
8. Perceived Severity	.03	-.02	-.02	.14	.08	.02	.01	-	.27**	-.06	.62**	.37**	-.25**	.07	.01	.01	-.06
9. Fear	.18*	.02	-.06	.19*	.14	.10	.28**	.27**	-	.04	.31**	.22*	-.17	.10	.07	.50	.04
10. MRR	.08	-.07	.01	.19*	-.10	-.15	.30**	-.06	.50	-	-.16	-.18*	.40**	-.13	-.15	-.20*	-.10
11. Response Efficacy	-.05	-.05	-.07	.12	.16	.06	.02	.62**	.31**	-.16	-	.63**	-.40**	.21*	.04	.08	-.04
12. Self-Efficacy	-.15	-.01	.03	.01	.39**	.23*	-.06	.37**	.22*	-.18*	.63	-	-.51**	.45**	.23	.28**	.16
13. Response Costs	.11	.04	-.03	.15	-.41**	-.28**	.13	-.25**	-.17	.40**	-.40**	-.51**	-	-.40**	-.31*	.43**	.20*

Table 2 cont.

Bivariate Correlations

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
14. Intention Frequency	-.14	-.05	-.14	-.10	.84**	.52**	-.10	-.07	.10	-.13	.21*	.44**	-.40**	-	.58*	.74**	.43**
15. Intention Minutes	-.12	-.14	-.10	-.21	.60*	.92**	-.10	.02	.07	-.15	.04	.23	-.31*	.58	-	.55*	.88**
16. Actual Frequency	-.06	-.06	-.16	-.17	.85**	.53**	-.07	.01	.05	-.20*	.08	.27**	-.43**	.74**	.55*	-	.48*
17. Actual Minutes	-.21*	-.14	-.10	-.27**	.46**	.78**	-.14	-.06	.04	-.10	-.04	.16	-.20**	.43**	.88**	.48**	-

Note: Prior Frequency, Prior Minutes, Intention Frequency, Intention Minutes, Actual Frequency, & Actual Minutes = "of Exercise, Vuln. = Vulnerability, MRR = Maladaptive Response Rewards, *$p < .05$, **$p < .01$

Table 3

Prediction of Intent to Exercise

Predictor	β	Standard Error	t
Perceived Severity	-.07	.67	-.66
Perceived Vulnerability	-.08	.31	-.94
Fear	.05	.30	.60
Response Efficacy	-.12	.87	-.95
Self-Efficacy	.41	.53	3.67**
Maladaptive Response Rewards	.01	.40	.16
Response Costs	-.26	.57	-2.64*

R^2 = .27**

Note: *p < .01, **p < .05

Table 4

Prediction of Actual Exercise (at Time 2)

Predictor	β	Standard Error	t
Perceived Severity	-.02	.69	-.17
Perceived Vulnerability	-.02	.31	-.16
Fear	.01	.30	.14
Response Efficacy	-.17	.91	-.17
Self-Efficacy	.21	.57	.07
Maladaptive Response Rewards	-.08	.40	-.78
Response Costs	-.38	.59	-3.67*

R^2 = .22*

Note: $*p < .001$

REFERENCES

Adamson, L., Brown, W., Byles, J., Chojenta, C., Dobson, A., Fitzgerald, D., et al. (2007). Women's weight: findings from the Australian Longitudinal Study on Women's Health. Report prepared for the Australian Government Department of Health, Aging, pp. 1-6.

American Cancer Society (ACS). (2012). *Annual Report: Rate of Cancer Deaths Continues to Fall.* Retrieved from: http://www.cancer.org/Cancer/news/annualreport-rate-of-cancer-deaths-continues-to-fall

American Psychological Association (APA). (2013). *Changing Diet and Exercise for Kids.* Retrieved from: http://www.apa.org/topics/children/healthy-eating.aspx?item=1

Anderson, J.R., Aasprang, A., Bergsholm, P., Sletteskog, N., Vage, V., & Natvig, G.K. (2010). Anxiety and depression in association with morbid obesity: changes with improved physical health after duodenal switch. *Health and Quality of Life Outcomes, 8,* 52-58.

Anderson, R.J. & Brice, S. (2011). The mood-enhancing benefits of exercise: memory biases augment the effect. *Psychology of Sport and Exercise, 12*(2), 79-82.

Annesi, J.J. (2011). Self-regulatory skills usage strengthens the relations of self-efficacy for improved eating, exercise, and weight in the severely obese: toward an explanatory model. *Behavioral Medicine, 37,* 71-76.

Applebaum, M. (2008). Why diets fail—expert diet advice as a cause of diet failure. *American Psychologist, 63*(3), 200-202.

Becker, M. H. (1974). The health belief model and personal health behaviour. *Health Education Monographs, 2*(4).

Beydoun, M.A. & Wang, Y. (2010). Pathways linking socioeconomic status to obesity through depression and lifestyle factors among US adults. *Journal of Affective Disorders, 123*, 52-63.

Bhuvaneswar, C.G., Baldessarinii, R.J., Harsh, V.L., & Al-Pert, J.E. (2009). Adverse endocrine and metabolic effects of psychotropic drugs. *CNS Drugs, 23*(12), 1003-1021.

Black, A. (1990). Analysis of census data on walking to work and working from home. *Transportation Quarterly, 44*(1), 107-120.

Blaylock, J., Smallwood, D., Kassel, K., Variyam, J., & Aldrich, L. (1999). Economics, food choices, and nutrition. *Food Policy, 24*(2-3), 269-286.

Borer, K.T. (2008). How effective is exercise in producing fat loss? *Kinesiology, 40*(2), 126-137.

Brownell, K.D & Yach, D. (2005). The battle of the bulge. *Foreign Policy*, 26-27.

Buchner, A., Erdfelder, E., Faul, F., Lang, A. (2009). G*Power (Version 3.1.2) [Computer Program]. Retrieved from http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/

Centers for Disease Control and Prevention (CDC, 2011a). *About BMI for Adults*. Retrieved from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

Centers for Disease Control and Prevention (CDC, 2011c). *Diabetes Public Health Resource.* Retrieved from http://www.cdc.gov/diabetes/

Centers for Disease Control and Prevention (CDC, 2010a). *Genomics and Health*. Retrieved from http://www.cdc.gov/genomics/resources/diseases/obesity/

Centers for Disease Control and Prevention (CDC). (2008). *National Health Interview Survey: Chronic Conditions, Ages 18+: US, 1997-2008*. Retrieved from http://205.207.175.93/hdi/ReportFolders/ReportFolders.aspx?IF_ActivePath=P,19

Centers for Disease Control and Prevention (CDC). (2010d). *National Health Interview Survey: Overweight/Obesity, Ages 20+: US, 1988-2010*. Retrieved from http://205.207.175.93/HDI/ReportFolders/reportFolders.aspx

Centers for Disease Control and Prevention (CDC). (2010b). *Overweight and Obesity*. Retrieved from http://www.cdc.gov/obesity/index.html

Centers for Disease Control and Prevention (CDC). (2011b). *Physical activity resources for health professionals*. Retrieved from http://www.cdc.gov/physicalactivity/professionals/index.html

Centers for Disease Control and Prevention (CDC). (2010c). *Programs, interventions, and campaigns*. Retrieved from http://www.cdc.gov/physicalactivity/professionals/programs/index.html

Collins, K.M. Dantico, M., Shearer, N.B., Mossman, K.L. (2004). Heart disease awareness among college students. *Journal of Community Health, 29*(4), 405-420.

Courneya, K.S. & Hellsten, L.-A. M. (2001). Cancer prevention as a source of exercise motivation: an experimental test using protection motivation theory. *Psychology, Health, and Medicine, 6*(1), 59-64.

Cox, D.N. & Bastiaans, K. (2007). Understanding Australian consumers' perceptions of selenium and motivations to consume selenium enriched foods. *Food Quality and Preference, 18*(1), 66-76.

Cox, D.N., Koster, A., & Russell, C.G. (2004). Predicting intentions to consume functional foods and supplements to offset memory loss using an adaptation of protections motivation theory. *Appetite, 43,* 55-64.Davis, C.L., Tomporowski, P.D., McDowell, J.E., Austin, B.P., Miller, P.H., Yanasak, N.E., Allison, J.D., & Naglieri, J.A. (2011). Exercise improves executive function and achievement and alters brain activation in overweight children: a randomized controlled trial. *Health Psychology, 30*(1), 91-98.

Desai, M.N., Miller, W.C., Staples, B., & Bravender, T. (2008). Risk factors associated with overweight and obesity in college students. *Journal of American College Health, 67*(1), 109-114.

Dik, M., Deeg, D.J., Visser, M., & Jonker, C. (2003). Early life physical activity and cognition at old age. *Journal of Clinical and Experimental Neuropsychology, 25*(5), 643-653.

Dorfman, L. & Yancey, A.K. (2009). Promoting physical activity and health eating: convergence in framing the role of industry. *Preventive Medicine, 49*, 303-305.

Driskell, J.A., Kim, Y., & Goebel, K.J. (2005). Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. *Journal of the American Dietetic Association, 705*(5), 798-801.

Dutta, M.J. & Youn, S. (1999). Profiling healthy eating consumers: a psychographic approach to social marketing. *Social Marketing Quarterly, 5*(4), 5-21.

Emery, S.L., Szczypka, G., Powell, L.M., & Chaloupka, F.J. (2007). Public health obesity-related TV advertising: lessons learned from tobacco. *American Journal of Preventive Medicine, 33*(4S), S257-S263.

Faith, M.S., Butryn, M., Wadden, T.A., Fabricatore, A., Nguyen, A.M., Heymsfield, S.B. (2011). Evidence for proscpetive associations among depression and obesity in population-based studies. *Obesity Reviews, 12*, e438-e453.

Finkelstein, E.A., Fiebelkorn, I.C., & Wang, G. (2003). National medical spending attributable to overweight and obesity: how much, and who's paying? [electronic version] *Health Affairs*, 219-226, retrieved from www.content.healthaffairs.org.

Floyd, D.L., Prentice-Dunn, S., & Rogers, R.W. (2000). A meta-analysis of research on Protection Motivation Theory. *Journal of Applied Social Psychology, 30*(2), 407-429.

Fontaine, K.R., Cheskin, L.J., & Barofsky, I. (1996). Health-related quality of life in obese persons seeking treatment. *Journal of Family Practice, 43,* 265-266.

Fruin, D.J., Pratt, C., & Owen, N. (1991). Protection motivation theory and adolescents' perception of exercise. *Journal of Applied Social Psychology, 22*, 55-69.

Geer, E.B., Shen, W., Gallagher, D., Punyanitya, M., Looker, H.C., Post, K.D., & Freda, P.U. (2010). MRI assessment of lean and adipose tissue distribution in female patients with Cushing's disease. *Clinical Endocrinology, 73*, 469-475.

Gesink-Law, D.C., Maclehose, R.F., & Longnecker, M.P. (2007). Obesity and time to pregnancy. *Human Reproduction, 22*, 414-420.

Gollwitzer, P.M. (1993). Goal achievement: the role of intentions. *European Review of Social Psychology, 4*, 141-185.

Hall, K.D., Sacks, G., Chandramohan, D., Chow, C.C., Wang, Y.C., Gortmaker, S.L., Swinburn, B.A. (2011). Quantification of the effect of energy imbalance on bodyweight. *Lancet, 378*, 826-837.

Hansen, D., Dendale, P., van Loon, L.J.C., & Meeusen, R. (2010). The impact of training modalities on the clinical benefits of exercise intervention in patients with cardiovascular disease risk of type 2 diabetes mellitus. *Sports Medicine, 40*(11), 921-940.

Heckhausen, H. (1991). *Motivation and Action.* New York: Springer.

Hensen, S., Masakure, O., & Cranfield, J. (2008). The propensity for consumers to offset health risks through the use of functional foods and nutraceuticals: the case of lycopene. *Food Quality and Preference, 19*(4), 395-406.

Huang, T.T.K., Harris, K.J., Lee, R.E., Nazir, N., Born, W., & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health, 52*(2), 83-86.

Jackson, R.A., Berry, T.R., Kennedy, M.D. (2009). The relationship between lifestyle and campus eating behaviors in male and female university students. *College Student Journal, 43*(3).

Karlamangla, A.S., Merkin, S.S., Crimmins, E.M., & Seeman, T.E. (2010). Socioeconomic and ethnic disparities in cardiovascular risk in the United States, 2001-2006. *Annals of Epidemiology, 20*(8), 617-628.

Kivimaki, M., Lawlor, D.A., Singh-Manoux, A., Batty, G.D., Ferrie, J.E., Shipley, M.J., Nabi, H., Sabia, S., Marmot, M.G., & Jokela, M. (2009). Common mental disorder

and obesity: insight from four repeat measures over 19 years: prospective Whitehall II cohort study. *British Medical Journal, 339*, b3765.

Kohler, C. L., Grimley, D., & Reynolds, K. (1999). Theoretical approaches guiding the development and implementation of health promotion programs. In J. M. Raczynski, & Raczynski and R. J. DiClemente (Eds.), *Handbook of Health Promotion and Disease Prevention*. New York: Kluwer Academic/Plenum Publishers.

Lewis, S., Thomas, S.L., Blood, R.W., Castle, D.J., Hyde, J., & Komesaroff, P.A. (2011). How do obese individuals perceive and respond to the different types of obesity stigma that they encounter in their daily lives? A qualitative study. *Social Science & Medicine, 73*, 1349-1356.

Lillis, J., Levin, M.E., & Hayes, S.C. (2011). Exploring the relationship between body mass index and health related quality of life: A pilot study of the impact of weight self-stigma and experiential avoidance. *Journal of Health Psychology, 16*(5), 722-727.

Linde, J.A., Simon, G.E., Ludman, E.J., Ichikawa, L.E., Operskalski, B.H., Arterburn, D., Rohde, P, Finch, E.A., & Jeffery, R.W. (2011). A randomized controlled trial of behavioral weight loss treatment versus combined weight loss/depression treatment among women with comorbid obesity and depression. *Annals of Behavioral Medicine, 41*, 119-130.

Lippke, S. & Plotnikoff, R.C. (2006) Stages of change in physical exercise: a test of stage discrimination and nonlinearity. *American Journal of Health Behavior, 30*(3), 290-301.

Lippke, S. & Plotnikoff, R.C. (2009). The protection motivation theory within the stages of the transtheoretical model – stage specific interplay of variables and prediction of exercise stage transitions. *British Journal of Health Psychology, 14,* 211-229.

Livhits, M, Mercado, C., Yermilov, I., Parikh, J.A., Dutson, E., Mehran, A, Ko, C.Y., Shekelle, P. G., and Gibbons, M.M. (2011). Is social support associated with greater weight loss after bariatric surgery?: a systematic review. *Obesity Reviews, 12,* 142-148.

Luppino, F.S., de Wit, L.M., Bouvy, P.F., Stijnen, T., Cuijpers, P. Penninx, B.W., & Zitman, F.G. (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry, 67*(3), 220-229.

MacDonald, J.M., Stokes, R.J., Cohen, D.A., Kofner, A., & Ridgeway, G.K. (2010). The effect of light rail transit on body mass index and physical activity. *American Journal of Preventive Medicine, 39*(2), 105-112.

McGowan, E.L. & Prapavessis, H. (2010). Colon cancer information as a source of exercise motivation for relatives of patients with colon cancer. *Psychology, Health, and Medicine, 15*(6), 729-741.

Mei, Z., Grummer-Strawn, L.M., Pietrobelli, A., Goulding, A., Goran, M.I., Dietz, W.H. (2002). Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents. *American Journal of Clinical Nutrition, 75*(6), 978-985.

Milne, S., Orbell, S., & Sheeran, P. (2002). Combining motivational and volitional interventions to promote exercise participation: protection motivation theory and implementation intentions. *British Journal of Health Psychology, 7*, 163-184.

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: a meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology, 30*(1), 106-143.

Moore, S.C., Patel A.V., Matthews, C.E., Berrington de Gonzalez, A., Park, Y., Katki, H.A., Linet, M.S., Weiderpass, E., Visvanathan, K., Helzlsouer, K.J., Thun, M., Gapstur, S.M., Hartge, P., Lee, I. (2012). Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. *PLoS Medicine, 9*(11), http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001335

Morrell, J.S., Lofgren, I.E., Burke, J.D., & Reilly, R.A. (2012). Metabolic syndrome, obesity, and related risk factors among college men and women. *Journal of American College Health, 60*(1), 82-89.

Mosca, L., Jones, W.K., King, K.B., Ouyang, P., Redberg, R.F., & Hill, M.N. (2009). Awareness perception and knowledge of heart disease risk and prevention among women in the United States. American Heart Association Women's Heart Disease and Stroke Campaign Task Force. *Archivesof Family Medicine, 9*(6), 506-515.

Murphy, J.M., Horton, N.J., Burke, J.D., Monson, R.R., Lairds, N.M., Lesage, A., & Sobol, A.M. (2009). Obesity and weight gain in relation to depression: findings from the Stirling County study. *International Journal of Obesity, 33*, 335-341.

National Heart, Lung, and Blood Institute (NHLBI). (2010). *Overweight and Obesity*. Retrieved from http://www.nhlbi.nih.gov/health/dci/Diseases/obe/obe_whatare.html

Nelson, M.C., Story, M., Larson, N.I., Neumark-Sztainer, D., & Lytle, L.A. (2008). Emerging adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity, 16*(10), 2205-2211.

Pearson, N., MacFarlane, A., Crawford, D., & Biddle, S.J.H. (2009). Family circumstance and adolescent dietary behaviours. *Appetite, 52*, 668-674.

Plante, T.G., Gustafson, C., Brecht, C. Imberi, J., Sanchez, J. (2011). Exercising with an iPod, friend, or neither: which is better for psychological benefits? *American Journal of Health Behavior, 35*(2), 199-208.

Plotnikoff, R.C., Blanchard, C., Hotz, S.B., & Rhodes, R. (2001). Validation of the decisional balance constructs of the transtheoretical model in the exercise domain: A longitudinal test in a population sample. *Measurement in Physical Education & Exercise Science, 5,* 191-206.

Plotnikoff, R.C. & Higginbotham, N. (1995). Predicting low-fat diet intentions and behaviors for the prevention of coronary heart disease: an application of protections motivation theory among an Australian population. *Psychology & Health, 10*(5), 397-408.

Plotnikoff, R.C. & Higginbotham, N. (2002). Protection motivation theory and exercise behavior change for the prevention of coronary heart disease in a high-risk, Australian representative community sample of adults. *Psychology, Health, & Medicine, 7*(1), 87-98.

Plotnikoff, R.C., Lippke, S., Trinh, L., Courneya, K.S., Birkett, N., & Sigal, R.J. (2010). Protection motivation theory and the prediction of physical activity among adults with type 1 or type 2 diabetes in a large population sample. *British Journal of Health Psychology, 15,* 643-661.

Plotnikoff, R.C., Rhodes, R.E., Trinh, L. (2009). Protection motivation theory and physical activity: a longitudinal test among a representative population sample of Canadian adults. *Journal of Health Psychology, 14*(8), 1119-1134.

Ponder, M., Lee, J., Green, J., Richards, M. (1996). Family history and perceived vulnerability to some common diseases: a study of young people and their parents. *Jounrnal of Medical Genetics, 33*(6), 485-492.

Puhl, R. & Brownell, K. (2006) Confronting and coping with weight stigma: an investigation of overweight and obese adults. *Obesity (Silver Spring), 14*(10), 1802-1815.

Purcell, S.H. & Moley, K.H. (2011). The impact of obesity on egg quality. *Journal of Assisted Reproduction and Genetics, 28*(6), 517-524.

Racette, S.B., Deusinger, S.S., Strube, M.J., Highstein, G.R., Deusinger, R.H. (2005). Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *Journal of American College Health, 52*, 245-251.

Reid, R.D., Tulloch, H, Kocourek, J., Morrin, L.I., Beaton, L.J., Papadakis, S., Blanchard, C.M., Riley, D.L., & Pipe, A.L. (2007). Who will be active? Predicting exercise stage transitions after hospitalization for coronary artery disease. *Canadian Journal of Physiology and Pharmacology, 85*, 17-23.

Rhodes, R.E. & Plotnikoff, R.C. (2005). Can current physical activity act as a reasonable proxy measure of future physical activity? Evaluating cross-sectional and passive prospective designs with the use of social cognition models. *Preventive Medicine, 40*, 547-555.

Rogers, R.W., & Prentice-Dunn, S. (1997). Protection motivation theory. In D. Gochman (Ed.), *Handbook of Health Behavior Research: Vol. 1. Determinants of health behavior: Personal and Social* (pp. 113-132). New York, NY: Plenum.

Rose, E.A. & Parfitt, G. (2012). Exercise experience influences affective and motivational outcomes of prescribed and self-selected intensity exercise. *Scandinavian Journal of Medicine and Science in Sports, 22*, 265-277.

Rosenkranz, S.K., Townsend, D.K., Steffens, S.E., & Harms, C.A. (2010). Effects of a high-fat meal on pulmonary function in healthy subjects. *European Journal of Applied Physiology, 109*, 499-506.

Rosenstock, I.M. (1966). Why people use health services. *Millbank Memorial Fund Quarterly, 44*, 94-124.

Rukavina, P.B. & Li, W. (2011). Adolescents perceptions of controllability and its relationship to explicit obesity bias. *Journal of School Health, 81,* 8-14.

Ruthig, J. C. (2013). *Applying protection motivation theory to examine health risk perceptions and exercise in late life.* Manuscript under review for publication.

Sallis, J.F. & Glanz, K. (2009). Physical activity and food environments: solutions to the obesity epidemic. *The Milbank Quarterly, 87*(1), 123-154.

Scarpa, R. & Thiene, M. (2011). Organic food choices and protection motivation theory: addressing the psychological sources of heterogeneity. *Food Quality and Preference, 22*, 532-541.

Seally (2010). Parents perceptions of food availability: implications for childhood obesity. *Social Work in Health Care, 49*, 565-580.

Seigel, P., Brackbill, P., & Heath, G. (1995). The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *American Journal of Public Health, 85*(5), 706-710.

Sherrid, P. (2003, June 8). Piling on the profit: There's no slimming down for companies selling diet products. *U. S. News and World Report*. Retrieved June 4, 2009, from http://health.usnews.com/usnews/health/articles/030616/16profit.htm

Siervo, M. (2009). The contribution of psychosocial stress to the obesity epidemic: an evolutionary approach. *Hormone and Metabolic Research, 41*(4), 261-270.

Smith, M.L., Dickerson, J.B., Sosa, E.T., McKyer, E.L.J., & Ory, M.G. (2012). College students' perceived disease risk versus actual prevalence rates. *American Journal of Health Behavior, 36*(1), 96-106.Vella-Zarb, R.A. & Elgar, F.J. (2009). The "Freshman 5": A meta-analysis of weight gain in the freshman year of college. *Journal of American College Health, 58*(2), 161-166.

Stanley, M.A. & Maddux, J.E. (1986). Cognitive processes in health enhancement: investigation of a combined protection motivation and self-efficacy model. *Basic and Applied Social Psychology, 7*, 101-113.

Tabachnick, G.G. & Fidell, L.S. (2007). *Using Multivariate Statitsics, 5th ed.* Boston: Allyn and Bacon.

Tavares, L.S., Plotnikoff, R.C., & Loucaides, C. (2009). Social-cognitive theories for predicting physical activity behaviours of employed women with and without young children. *Psychology, Health, and Medicine, 14*(2), 129-142.

Thomas, S.L., Hyde, J., Karunaratne, A., Herbert, D., & Komesaraoff, P.A. (2007). Being "fat" in today's world: a qualitative study of the lived experiences of people with obesity in Australia. *Health Expectations, 11*, 321-330.

Tulloch, H., Reida, R., Slovinec-D'Angeloa, M., Plotnikoff, R.C., Morrina, L., Beatona, L., Papadakisa, S., & Pipe, A. (2009). Predicting short and long-term exercise intentions and behavior in patients with coronary artery disease: a test of protection motivation theory. *Psychology and Health, 24*(3), 255-269.

Umeh, K. (2004). Cognitive appraisals, maladaptive coping, and past behavior in protection motivation. *Psychology and Health, 19*(6), 719-735.

U.S. Department of Health and Human Services (USDHHS, 2011). *Healthy People 2020.* Retrieved from http://healthypeople.gov/2020/default.aspx

Vella-Zarb, R.A. & Elgar, F.J. (2009). The 'freshman 5': a meta-analysis of weight gain in the freshman year of college. *Journal of American College Health, 58*(2), 161-166.

Wane, S., van Uffelen, J.G.Z., & Brown, W. (2010). Determinants of weight gain in young women: a review of the literature. *Journal of Women's Health, 19*(7), 1327-1340.

Wang, Y. & Beydoun, M.A. (2007). The obesity epidemic in the United States-gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiologic Reviews, 29*(1), 6-28.

Webbink, D., Martin, N., Visscher, P.M. (2010). Does education reduce the probability of being overweight? *Journal of Health Economics, 29*(1), 29-38.

Wendt, S.J. (2005). Perceptions of future risk of breast cancer and coronary heart disease in female undergraduates. *Psychology, Health, and Medicine, 10*(3), 253-262.

World Health Organization (2011b). *Global recommendations on physical activity for health*. Retrieved from http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/

World Health Organization (2011a). *Obesity and overweight*. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/

Wurtele, S.K. (1988). Increasing women's calcium intake: the role of health beliefs, intentions, and health value. *Journal of Applied Social Psychology, 18*, 627-639.

Wurtele, S.K. & Maddux, J.E. (1987). Relative contributions of protection motivation theory components in predicting exercise intentions and behavior. *Health Psychology, 6*, 453-466.

Zhang, Y. & Cooke, R. (2012). Using a combined motivational and volitional intervention to promote exercise and healthy dietary behavior among undergraduates. *Diabetes Research and Clinical Practice, 95*, 215-223.