The Impact of Macronutrient Intake on Body Image among Female College Undergraduate Students

by

Laurelyn Harper

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Carol Seaborn

Carol Seaborn, Ph.D., R.D., C.D., C.F.C.S.

Committee Members:

Kerry D Peterson

Kerry Peterson, Ph.D., R.D.

John Klem, Ph.D.

The Graduate School

University of Wisconsin-Stout

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The Graduate School
University of Wisconsin-Stout
Menomonie, WI

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ABSTRACT

Research has shown that lower body satisfaction predicts higher levels of dieting, unhealthy and very unhealthy weight control behaviors and binge eating, as well as lower levels of physical activity and fruit and vegetable consumption. The purpose of this study was to determine if there was a correlation between macronutrient intake (fat, protein, and carbohydrates), exercise, and body image among female undergraduate college students at a small Midwestern University. Data collection included height, weight, body fat percentage, skinfold measurements, 24-hour diet recall, record of exercise, and Multidimensional Body-Self Relations Questionnaire (N=86). MBSRQ subscales used included appearance evaluation, appearance orientation, fitness evaluation, fitness orientation, health evaluation, health orientation, body areas satisfaction scales, overweight preoccupation, and self-classified weight. Results found numerous correlations between the MBSRQ subscales and diet, exercise, and body fat percentage using

Pearson r correlations. Fitness evaluation and orientation were positively related to the number of days exercised and varying intensities. A negative association between appearance evaluation, fitness orientation, health orientation, and body areas satisfaction scale and body fat percentages was noted, while a positive correlation with overweight preoccupation and self-classified weight was noted.

Significant differences between means of normal weight and overweight subjects and body image were found using t-tests. Normal weight individuals based on BMIs (less than 25 kg/m^2) had higher appearance evaluation, fitness orientation, health evaluation, health orientation, and body areas satisfaction scores compared to those that were overweight. Lower scores on the overweight preoccupation and self-classified weight subscales were found in the normal weight group.

Diet, exercise, and body fat percentage were found to be associated with body image. Further research is needed to explore relationships more in depth.

The Graduate School

University of Wisconsin Stout

Menomonie, WI

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Chapter I: Introduction

Everywhere people look, society's version of what a female should look like is present. On television and in the movies, most of the women are thin. Musicians all seem to be on the thinner side, and of course looking at any magazine, we are reminded of what we should look like. Magazine after magazine at the grocery store checkout reminds us of how to look and how to obtain this ideal; "drop one size in two weeks," "best beach body," and "405 ways to look hot." During adolescence and early adulthood, people are trying to find their identity. It is no wonder that almost half of girls surveyed by Strauss (1999) thought they were too fat. The body that people are comparing themselves to is what is portrayed in the media, which is the very slim, tall, and beautiful girl. It seems that there is no way to escape exposure to society's ideal body image.

Young women are more likely to adopt a value system based on outer appearance (Keel, Baxter, Heatherton, & Joiner, 2007). Unfortunately, they tend to feel important if their weight or body shape fits the ideal. A huge discrepancy between the body shape of models and the average women exists. The average woman stands 5'4'' tall and weighs 140 pounds in contrast to the average model standing 5'11'' tall and weighing only 117 pounds, as stated by the National Eating Disorders Association (2005). Trying to measure up to society's ideal body weight can decrease body satisfaction, especially when the ideal is unattainable. It is not realistic for everyone to look tall, thin, and beautiful.

Body dissatisfaction occurs when the perceived body image and the ideal body image are not congruent (Gruber, Pope, Lalonde, & Hudson, 2001; Zellner, Harner, & Adler, 1989). If the ideal body image is not realistic, a greater amount of body dissatisfaction can occur. No matter how much a specific ideal body shape is desired,

attaining that body shape may not be possible through the healthy means of sensible diet and exercise. Negative body satisfaction is not common among all populations; it tends to be more prevalent in women compared to men (Strauss, 1999). One potential cause of this difference may be due to the emphasis placed on outer appearance to look skinny. Unlike women, most men do not want to appear skinny, but desire to be larger with an increased amount of muscle (Drewnowski & Yee, 1987). Younger individuals also tend to have a greater degree of dissatisfaction according to Keel et al. (2007). When younger more self-worth is placed on outer appearance. As a person ages, self worth is determined more by successes in life (Keel et al.).

A number of factors influence a person's body image. Society plays a large role, but research is finding that the foods a person consumes can change his or her body image temporarily. In a study conducted by Vocks, Legenbauer, and Heil (2007), women were divided into one of two groups. The first group was instructed to drink a milkshake while viewing a neutral video. The second group only watched the video without consuming anything. Subjects filled in the Body Image States Scale and Mood Questionnaire as well as reported indicating their actual, ideal, and felt body dimensions based on digitally distorted photographs of themselves before and after watching the video. The researchers found a difference in body image for those consuming the milkshake. Those participants had a decreased body image. Also, the difference in estimations of ideal and actual body size increased after milkshake consumption. After consuming the milkshake the subjects may have felt heavier than originally making the difference greater. This is one example how body satisfaction can be effected by food intake (Vocks, Legenbauer, & Heil).

In another study, adolescent subjects rated foods as how tasty, healthful, or if the foods were consumed by friends (Contento, Michela, & Williams, 1995). Weight and dieting status were also examined. It was predicted that an adolescent's concern for weight and body image would influence everyday food choices. Results showed high dieters valued taste and convenience less than low dieters. Low dieters and high dieters are individuals at one standard deviation below and above the dieting status mean. People that diet continuously, usually have higher quality diets and therefore are more health conscious. There is much debate if this is actually true or not. Contento et al. found that high dieters did in fact eat foods they believed were healthier compared to low dieters. High dieters were focused on consuming foods that would improve their actual body weight, meaning foods that were consumed would decrease or control body weight. Weight control is not always associated with overall healthy foods. A person may not need to control his or her weight, but are focusing on foods that control weight instead of foods that may prevent diseases.

Adolescents and young adults with lower body satisfaction may make specific diet and lifestyle choices. They may choose to eat healthier food or increase physical activity in order to try and obtain their ideal body shape. Partaking in a healthier diet and lifestyle choices may also make a person feel better just because they are doing something different. More research needs to be conducted to determine if body satisfaction can really serve as a motivator for healthy changes.

Statement of the Problem

Body image can greatly impact a person's daily life and health. A person with a distorted body image may be so preoccupied with how she looks that the preoccupation

interferes with the ability to study, sleep, and enjoy once pleasurable experiences. Some people with greater body dissatisfaction will go to drastic measures to achieve the ideal in which they strive. Certain foods may be eliminated from the diets or food intake in general is reduced. Young women need proper nutrition to maintain a healthy body. The habits formed in early adulthood shape the rest of a person's life. This is why a balanced diet is so important; however, it is difficult to have a balanced diet if a person is too preoccupied with their body image. More studies need to be conducted examining body image and food choices. In one study by Neumark-Sztainer, Paxton, Hannan, Haines, and Story (2006), it was shown that lower body satisfaction predicted higher levels of dieting, unhealthy and very unhealthy weight control behaviors and binge eating, as well as lower levels of physical activity and fruit and vegetable consumption. Body image is a predictor of eating disorders, meaning that the more dissatisfied a person is with the way he or she looks, the more likely an eating disorder will develop (Keel, Baxter, Heatherton, & Joiner, 2007; Neumark-Sztainer et al., 2006). For these reasons, this study examined whether macronutrient (carbohydrate, protein and fat) intake significantly impacted body image among female college undergraduate students.

Purpose of the Study

The purpose of this study was to determine if there was a correlation between macronutrient intake and body image among female undergraduate college students. After approval by the Human Subjects Committee, data were collected at the University of Wisconsin–Stout during the spring of 2009 through the use of the Multidimensional Body-Self Relations Questionnaire and anthropometric measurements. In addition, a 24

hour diet recall, and description of exercise was collected to determine the macronutrient intake and physical activity level.

Research Objectives

1. To determine if correlations exist between body image and macronutrient intake among female college students.
2. To determine if correlations exist between body image and physical activity levels among female college students.
3. To determine if correlations exist between body image and body fat percentage among female college students.
4. To determine if correlations exist between different body image assessment scales of the MBSRQ.
5. To determine if differences exist between group means of BMI and body image among female college students.

Definition of Terms

The following definitions are included to assist in the clarification and comprehension of this study:

A 24 hour diet recall. Assessment tool where a person recalls all foods and beverages consumed over a twenty-four-hour period.

Adequate intake (AI). The estimated daily intake needed to meet the requirement of a nutrient when insufficient evidence is found in order to set a recommended dietary allowance (Institute of Medicine, 2005).

Anthropometric measurements. Measurements of physical characteristics including height, weight, and body fat.

Body dissatisfaction. Defined as the difference in percentage of body fat between one's perceived body weight and one's ideal (Gruber, Pope, Lalonde, & Hudson, 2001).

Body image. How a person sees him or herself physically.

Body Mass Index (BMI). Measurement calculated by dividing weight in kilograms by height in meters squared; preferred overweight to height standard; used as a determinant of health risk and predictor of mortality.

Complex carbohydrates. Starches and fibers that are made of numerous sugar molecules in straight chains or branched chains (Whitney & Rolfes, 2002).

Estimated average requirement (EAR). The estimated intake of a nutrient needed to meet required amount (Institute of Medicine, 2005).

High fructose corn syrup (HFCS). A refined type of sugar containing both fructose and glucose molecules made by processing corn syrup to increase the fructose content, thus increasing the sweetness; typically found in processed foods (Gaby, 2005)

Macronutrients. Nutrients needed in large quantities in a person's diet; fat, protein and carbohydrates.

Recommended dietary allowance (RDA). The estimated minimum daily intake needed to meet the requirement of a nutrient for the majority of healthy people (Institute of Medicine, 2005).

Refined or simple carbohydrates. Sugars that consist of one or two sugar molecules (Whitney & Rolfes, 2002).

Assumptions of the Study

There are a couple of assumptions that applied to this study. The first was the assumption that subjects participating in this study would answer questions as accurately,

honestly, and completely as possible. Another assumption was that female college students are interested in healthy eating and food choices are made based on nutritional content.

Limitations of the Study

Along with some of the assumptions, there were also limitations applied to this study. Subjects chosen to participate were not randomized. The courses in which subjects were chosen were also not picked at random; therefore the data gathered in this study may not be generalizable to the whole population of undergraduate female students at the University of Wisconsin–Stout or to other institutions. Another limitation resulted from the 24 hour dietary recall. Results from the subjects recording the food intake over the past 24 hours may not be accurate for a number of reasons, including under or over estimation of amount of foods, not remembering all the foods eaten, and not enough information provided about the food to correctly match that food to an item in the diet analysis software. The number of subjects in this study may be a limitation. With a lower sample size, statistical results may not be found for key relationships.

Chapter II: Literature Review

Introduction

This chapter will include a detailed discussion of body image including influences, effects on gender, body satisfaction, and assessment of body image. Eating disorders including prevalence, causes, and health consequences are discussed as eating disorders are related to body image and body satisfaction. Dieting and food preferences are also related to body satisfaction. This chapter will conclude with a discussion of dietary components including complex carbohydrates and refined carbohydrates, protein, and types of fats.

Body Image

According to the National Eating Disorders Association (2005), body image can be comprised of many things such as feelings, assumptions, or generalizations about ones own body, the image a person pictures in his or her mind, and how a person may feel in his or her body. The satisfaction with ones own body can be either positive or negative as described by the National Eating Disorders Association. A positive body image is when a person is comfortable and content with his or her body. They may be proud of what they look like and are realistic by seeing the different body parts as they truly are. Individuals with a negative body image may distort the way they look (National Eating Disorders Association). They may believe that some parts are much larger or smaller than they actually are. Feeling anxious, ashamed, or embarrassed about ones body is common with a negative body image (National Eating Disorders Association). People with a negative body image may also feel like they do not measure up to the ideal body shape.

Body dissatisfaction occurs when the perceived body image and the ideal body image are not congruent (Gruber et al., 2001; Zellner et al., 1989). There are a number of factors contributing to body dissatisfaction (Gruber et al., 2001). Gruber et al. state d that the actual amount of body fat a person has affects body dissatisfaction. People with more fat are likely to be more dissatisfied with their body. Second, the ideal body shape desired can lead to dissatisfaction. If a person has the ideal of looking like a model, but she is very short and stocky, this ideal for which she is striving, causes dissatisfaction. The last factor contributing to dissatisfaction is perception of one's body. For example, a person who believes there is a considerable amount of fat on the body will be more dissatisfied than a person with the same amount of fat, but a perception of less fat on the body.

The ideal body image that many women strive for is most likely much smaller than the actual size, even if the person is not overweight and considered thin. The ideal body weight for a female tends to be thin, while for males the ideal is a more muscular body shape (Jonnalagadda, Ziegler, & Nelson, 2004). Fashion models are thinner than 98% of American women (Smolak, 1996). A huge discrepancy between the body shape of models and average women exist. The average woman stands 5'4'' tall and weighs 140 pounds in contrast to the average model standing 5'11'' tall and weighing only 117 pounds, as stated by the National Eating Disorders Association (2005). Thus, it is not surprising that women have a negative body image.

Higher dissatisfaction is common in certain populations. A preference for a thinner contour is more widespread in females. Women are twice as likely to want to weigh less than men (Strauss, 1999). However, this is not to say that some men do not have a negative body image. Most men typically are not interested in weight loss, but are

more concerned with weight gain, size, and strength of their bodies (Drewnowski & Yee, 1987). Drewnowski and Yee further state that women have a tendency to describe themselves as overweight, worry about being fat, and express concern for their body weight. In another study women were found to perceive their current body shape as larger than their ideal shape more often than males and believed themselves to be heavier than what a female should weigh according to male preferences (Demarest & Allen, 2000). One last study looking at differences in body image and weight and gender found women attempted to lose weight more often than men (Wharton, Adams, & Hampl, 2008). Despite all the research focusing on the relationship between gender and body satisfaction, gender is not the only factor to impact body dissatisfaction.

Body dissatisfaction is greater depending on younger age as well. According to Lowery et al. (2005), up to 90% of college students worry about their body image. This high statistic may be due to the fact that college students feel they are assessed for physical attractiveness. A typical diet of a college student tends to be high in fat, sodium, and sugar, while low in fruits, vegetables, and dairy (Brunt et al., 2008). Female college students are more susceptible to partake in inappropriate weight management practices such as using laxatives, exercising excessively, or cutting calories (Wharton et al., 2008). Wharton et al. further states that the decisions and habits made during college establish lifelong habits. For example, if someone exercises regularly and eats a diet rich in fruit and vegetables, he or she will be more likely to have these same healthy habits later in life. Lowery et al. stated that being beautiful may be seen as an important part of having social success; thus, college students may be concerned about the way they look. Although many people in college are concerned about body image, only a small number

of male and female subjects in a study conducted by Brunt, Rhee, and Zhong (2008) were actually overweight or obese (~27% and 8%, respectively). When examining those with a higher BMI, a higher degree of body dissatisfaction was found (Jonnalagadda et al., 2004). Regardless of a person's weight, body dissatisfaction is common on college campuses. College is seen as a transition to adulthood and independent living (Brunt, Rhee, & Zhong, 2008; Wharton et al., 2008).

Assessment of Body Image

A variety of different tools exist to measure a person's body satisfaction. One common tool utilizes drawings of different body shapes for both males and females (Jonnalagadda et al., 2004; Zellner et al., 1989). Nine different female and male silhouettes ranging from extremely skinny to obese are shown. Individuals given this evaluation tool are then asked to pick out what their ideal figure is, what figure they perceive themselves to be, and finally what they perceive is attractive to the opposite sex. Individuals who tend to have lower body satisfaction have a greater discrepancy between their ideal figure and what they currently perceive themselves to look like (Zellner et al.).

Another version of this test exists to determine body satisfaction among adolescents (Kostanski & Gullone, 1999). Seven drawings of preadolescent silhouettes again ranging from thin to obese are used in this version. Similar to the adult version, adolescents are asked to choose which silhouette best represents what they look like, what they would like to look like, and what silhouette would be most attractive to the opposite sex. Discrepancies between the drawings chosen as ideal body types and actual body types indicate the level of body dissatisfaction. Other types of questionnaires exist such as the Body Shape Satisfaction Scale (Neumark-Sztainer et al., 2006). The Body

Shape Satisfaction Scale consists of ten items assessing satisfaction with different body parts including height, weight, body shape, waist, hips, thighs, stomach, face, body build, and shoulders. Individuals are asked to rank their satisfaction with each body part from "very dissatisfied" to "very satisfied." As shown by the examples given above, there are numerous ways to assess a person's body satisfaction.

The Multidimensional Body-Self Relations Questionnaire (MBSRQ) is a 69 item questionnaire that examines self-attitudinal aspects of the body image construct (Cash, 2000; Brown, Cash, & Mikulka, 1990). The MBSRQ is divided into seven subscales and three special multi-item subscales. The appearance evaluation is the first subscale that measures feelings of physical attractiveness or unattractiveness, and satisfaction or dissatisfaction with ones looks. The second subscale is appearance orientation that measures the extent of investment in one's appearance. Fitness evaluation is the third subscale that looks at feelings of being physically fit or unfit. The fourth subscale is fitness orientation that looks at the extent of investment of being physically fit. This subscale is similar to fitness evaluation in that high scorers value fitness and are actively involved in activities to enhance or maintain their fitness levels. The fifth subscale is health evaluation that measures feelings of physical health and/or freedom from illness. The sixth subscale is health orientation that focuses on the extent of investment in a physically healthy lifestyle. The last subscale is illness orientation that measures the extent of reactivity to being or becoming ill. The MBSRQ also has the body areas satisfaction scale, overweight preoccupation subscale, and the self-classified weight subscale.

One study conducted by Cash, Morrow, Perry, and Hrabosky (2004) used the MBSRQ as the main body satisfaction assessment tool. This study focused on body image of college students from the 1980s to 2001. Cash et al. found that appearance evaluation scores had significantly decreased followed by an increase over the time span in predominately white females. Overweight preoccupation scores increased, then decreased. These data suggest college students in 2001 are less dissatisfied with appearance and less preoccupied with weight compared to college students studied in the 1980s. Another study investigated body image of adult women using the MBSRQ survey (Cash & Henry, 1995). Out of the 803 subjects studied, it was found that 47.9% had a negative appearance evaluation, 35.6% had a negative body areas satisfaction, and 48.5% had a negative overweight preoccupation. This indicates that subjects were dissatisfied with their looks, were unhappy with the size or appearance of several areas, and were more likely to feel fat, diet, or restrain eating. Results from a study by Brown, Cash, and Mikulka (1990) using the same survey, showed individuals who valued or attended to certain events of each subscale domain were more likely to partake in activities to increase or maintain these same values or events. An example of this would be if someone felt their body was in good health, he or she would be more likely to have a lifestyle that would help maintain the health of his or her body.

Eating Disorders

One reason so much emphasis is put on body image is its link to the development of eating disorders. It has been shown in numerous studies that a negative body image is a predictor of the development, maintenance and relapse of eating disorders (Keel et al., 2007; McNamara, Hay, Katsikitis, & Chur-Hansen, 2008; Neumark-Sztainer et al., 2006;

Vocks et al., 2007). The three types of eating disorders include Eating Disorder Not Otherwise Specified, Anorexia Nervosa and Bulimia Nervosa. In order to be diagnosed with an eating disorder, specific criteria outlined in the Diagnostic and Statistics Manual of Mental Disorders, 4th edition-text revision (DSM-IV-TR) must be met. The specific criteria for diagnosis of anorexia nervosa are as follows (American Psychiatric Association, 2000):

> Refusal to maintain body weight at or above a minimally normal weight for age and height; intense fear of gaining weight or becoming fat, even though underweight; disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight; and absence of at least three consecutive menstrual cycles. (p. 589).

The diagnostic criteria for bulimia nervosa are as follows (American Psychiatric Association, 2000):

> Recurrent episodes of binge eating characterized by eating in a discrete period of time an amount of food that is definitely larger than most people would eat during a similar amount of time or a sense of lack of control over eating during the episode; recurrent inappropriate compensatory behavior in order to prevent weight gain; binge eating and inappropriate compensatory behaviors both occurring at least twice a week for three months; self-evaluation is unduly influenced by body shape and weight; and the disturbance does not occur exclusively during episodes of Anorexia Nervosa. (p. 594).

Individuals who met some but not all criteria for either Anorexia Nervosa or Bulimia Nervosa may be diagnosed with an eating disorder not otherwise specified (American Psychiatric Association, 2000). Approximately 50-60% of all cases of eating disorders are eating disorder NOS; about 30% are diagnosed with Bulimia Nervosa, with the remaining 10-15% diagnosed as Anorexia Nervosa (Fairburn, 2008).

People with eating disorders will have an intense fear of food and most likely have a strong body dissatisfaction as well (McNamara et al., 2008). McNamara found a correlation between body dissatisfaction and a fear response to food. In a much earlier study body satisfaction and abnormal eating patterns were identified by Zellner et al. (1989). It was found that women having a low Eating Attitudes Test, (EAT) were more likely to be dissatisfied with their current body shape and desired to be thinner than they believed themselves to be. Women with had a high EAT score had more abnormal eating patterns and also wanted to be thinner; however, their ideal thinness was much thinner than women with lower EAT scores. These data points toward the idea that abnormal eating behaviors and ideal body shape are related.

Keel et al. (2007) conducted a twenty year longitudinal study studying body weight, dieting and eating disorder symptoms. The peak period for developing eating disorders is in young adulthood (Keel et al.). Women tend to define self-worth by appearance rather than accomplishments in life. When more emphasis is placed on outward appearance the chance to have a negative body image increases. Keel et al. found that when women attained life roles such as marriage or motherhood, improvements to disordered eating were made. One reason for this might be that married women or women that have children do not equate their self-worth on appearance nearly

as much as an adolescent or young adult female. As women increase in age, they become more accepting of their bodies (Keel et al.). Keel's study helped support the research that eating disorders are more likely to develop in younger people.

Another aspect of eating disorders, especially anorexia nervosa, is dieting (American Psychiatric Association, 2000). Dieting is the behavior that is most tied to self-perceived weight status (Strauss, 1999). Those that believe themselves to be overweight also reported dieting regularly. Strauss found in his study that dieting was very common among subjects. A relationship between dieting and body satisfaction exists as indicated by Kostanski and Gullone (1999). Those that are unhappy with outward appearance are more likely to diet to change their body shape and obtain their body ideal. Extreme dieting and/or starvation are characteristics of anorexia nervosa. Body dissatisfaction is also associated with health compromising behaviors such as eating less fruits and vegetables and decreased physical activity (Neumark-Sztainer et al., 2006). These researchers also found that low body satisfaction was associated with dieting in the past year. One study examined the characteristics of dieters most at risk for developing eating disorders (Fairburn et al., 2005). About 3.5% of subjects developed an eating disorder within the two year follow up time period, with most frequent diagnosis being eating disorder not otherwise specified. Some characteristics included a preoccupation with food, eating in secret, fear of losing control over eating and the desire to have an empty stomach. Developing an eating disorder when an individual is completely satisfied with outward appearance would be unlikely (Fairburn, 2008).

Food Preferences

Food preferences can vary greatly from one person to another. Someone may love eating vegetables, while another person may avoid eating anything green. Many factors play a part in developing food preferences. As a person increases in age, preferences for healthy foods and healthier food intake patterns seem to increase (Drewnowski & Hann, 1999). Age is thus shown to influence food preferences. Drewnowski and Hann also found food preferences and food frequencies to be indicators of certain measured dietary outcomes. If people enjoy eating fruits and vegetables, intakes of fiber and vitamin C tended to be higher.

Body weight can also influence or be the result of a person's dietary preferences. Brunt et al. (2008) found that students with a higher BMI reported an increased intake of foods high in saturated fatty acids such as pork, lamb, and other meats. Brunt et al. also noted those with a lower BMI consumed more fruits and vegetables. Dieting status can also influence food preferences (Contento et al, 1995). Those that report dieting frequently tended to consume healthier foods, foods containing nutrients such as vitamins and minerals, and less sugary foods in comparison to those dieting less frequently. High dieters disapproved of foods that were higher in fat. When choosing foods to eat, low dieters tended to make selections based on what their friends' choices would be. Contento et al. also found those choosing foods based on if the food is healthy or not tend to disapprove of sugary foods.

Body image has been shown to be related to food intake. Vocks, et al. (2007) studied a group of females without eating disorders, examining the effects of food consumption on body satisfaction. Results showed that body satisfaction did indeed

decrease after consuming a milkshake, indicating body image can be affected by recent food consumption. Those consuming the milkshake had an increase in the discrepancy between an actual estimation and an ideal estimation of body size. The researchers hypothesized that the decrease in body image may be a result of realizing the consumption of the one liter milkshake could lead to weight gain. According to a study conducted by Neumark-Sztainer et al. (2006), a lower body satisfaction is related to more health compromising behaviors such as a decreased intake of fruits and vegetables, dieting, and binge eating. Food preferences are based upon numerous factors including age, weight, and body satisfaction. Determining why people eat what they do eat is difficult, but the research cited provides some insight to solving this puzzle.

Carbohydrates

Carbohydrates are the main source of energy for a person's diet. They provide energy to cells in the body, particularly the brain. Carbohydrates are one of the macronutrients that are needed in large quantities. According to the Institute of Medicine (2005), people should consume between 45-65% of their total caloric intake from carbohydrates. There are a variety of different dietary components that fall into the category of carbohydrates including both complex and refined carbohydrates. It has been proposed that sugar and other carbohydrates contribute to over eating and obesity (Rolls, 1995). There is some accuracy in this statement. Energy intake has increased since the 1970's in conjunction with an increase in carbohydrate intake (Gaesser, 2007). This correlation could be made since over half of the daily calories a person consumes are from carbohydrates.

Refined carbohydrates are sometimes called simple carbohydrates. These carbohydrates are made up of only one or two sugar molecules. One type of refined sugar is fructose. It is typically found in fruits and can have a number of potential negative effects on the body if consumed regularly in high amounts (Gaby, 2005). Obesity, accelerated aging, diabetes, high lipid levels, and chronic diarrhea are some of the claimed potential effects of fructose. Refined sugars are not as desirable as complex carbohydrates. These sugars provide empty calories, meaning a larger number of calories are in the food with little or no nutrients (Institute of Medicine, 2005). An example of this would be drinking a can of soda. A large quantity of sugar is present in soda, but no nutrients are found in this product. A piece of fruit or vegetable is an example of a food with few calories and numerous nutrients, including fiber. When people consume high amounts of empty calorie foods, their weight is likely to increase, as refined sugars do not increase satiety or reduce hunger like complex carbohydrates (Vermunt et al., 2003). Other research has examined the possible relationship between sugar consumption and indicators of body composition. In one study by Bolton-Smith and Woodward (1994), a significant correlation between the amount of sugar consumed and BMI was found. In a similar study, a relationship between sugar intake and the body fat percentage among women was determined (Miller, Linderman, Wallace, & Niederpruem, 1990). These are a few reasons why a diet high in refined grains leads to an increased risk for cardiovascular disease, type 2 diabetes, metabolic syndrome, and some cancers (Gaesser, 2007). For this reason, refined carbohydrates should be eaten in moderation.

Dietary Protein

Proteins are the main structural components of all cells within the body and are used to construct enzymes, transport carriers, and hormones. Protein is also needed to repair and replace damaged proteins, support immune function, and for growth of tissues (Phillips, Moore, & Tang, 2007). Proteins are made up of varying numbers of amino acids. When a person consumes protein, it is metabolized into the varying amino acids which can then be used for a number of functions. Amino acids serve as the building blocks of both DNA and RNA, the nucleic acids. Some of the amino acids are considered essential while others are not, meaning certain amino acids cannot be made by the body and these essential amino acids must come from the diet. Dietary protein is needed because proteins within the body are constantly being degraded and resynthesized. An estimated 250 grams of protein is degraded and resynthesized daily (Waterlow, 1984). Another reason for protein consumption is the need for a nitrogen source. A person consuming between 70-100 grams of protein will excrete between 11-15 grams of nitrogen each day (Institute of Medicine, 2005). In order to have enough protein for all the necessary functions, a dietary intake of 0.8 grams/kg/day is recommended by the Institute of Medicine.

Dietary Fats

Fats are an important part of the diet. There is a higher amount of energy per gram of fat compared to carbohydrate or protein. As a result, a major source of energy comes from dietary fats. Fats can either come from animal or plant sources. Dietary fat is essential because it plays multiple roles in the body such as components of cell membranes, serves as the storage form of energy within the body, and aides in absorption

of fat soluble vitamins A, D, E, and K. Total fat intake should make up approximately 20 to 35 percent of total caloric intake. In one study, it was found that the average intake of fat was 33% of total energy in the mid 1990s (Capps, Cleveland, & Park, 2002). Different types of fats exist; some more beneficial than others. There are four main types of fats, saturated fatty acids, monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), and *trans* fatty acids.

Saturated fatty acids are found mostly in animal products. The chemical structure consists of carbon atoms bonded to other carbon atoms with a carboxyl group at one end and methyl group at the other end. Hydrogen atoms attached to each carbon finish the chemical structure. Because there are no double bonds in the structure of saturated fat, this fat is solid at room temperature. Butter is one example of a food high in saturated fats. Most dietary saturated fat intake comes from eating animal products (USDA, 1996). Saturated fats are not an essential part of one's diet. For this reason, no RDA, EAR, or AI has been set. It is recommended that saturated fats provide less than seven percent of the total calorie intake according to the American Heart Association (2009). Saturated fats are considered a harmful type of fat. In a study of American Indians, dietary fat intake was calculated from 24-hour diet recalls (Xu, et al., 2006). It was indicated that those with a higher intake of total fat and saturated fat had a higher risk of coronary heart disease mortality. Saturated fats raise LDL cholesterol levels resulting in an increased risk of coronary heart disease (Hu, Manson, & Willett, 2001).

Conclusion

Body dissatisfaction is a problem among young people especially women who are twice as likely to want to weigh less (Strauss, 1999). According to Lowery et al. (2005),

up to 90% of college students worry about their body image. A typical diet of college students tends to be high in fat, sodium, and sugar, while low in fruits, vegetables, and dairy (Brunt et al., 2008). Adequate amounts of carbohydrate, protein, and fat are necessary for proper growth and development. Consuming too much or too little of any nutrient can lead to problems. Studies have shown a relationship between body satisfaction and diet (Contento, Michela, & Williams, 1995; Neumark-Sztainer et al., 2006). Neumark-Sztainer found people with a lower body satisfaction had a tendency to eat unhealthy foods, dieted more often, and participated in unhealthy weight control behaviors. Low body satisfaction can lead to other problems including eating disorders (Keel et al., 2007). For these reasons, this study examined the association of macronutrient intake and self image among female undergraduate college students.

Chapter III: Methodology

This chapter will include a discussion of data collection methods specifically, subject selection and description, instrumentation, data collection procedures, data analysis, and limitations.

Subject Selection and Description

Approval of this study was granted by the University of Wisconsin–Stout Institution Review Board. (Appendix A.) Subjects selected for the study were undergraduate female college students attending the University of Wisconsin–Stout. Subjects were chosen from a number of undergraduate courses where the researcher went into the class and asked for volunteers. Flyers were put up around campus as another means of recruitment (Appendix B). The goal was to recruit 60 to 70 volunteers. Participation in this study was strictly voluntary. Students who chose to participate were asked to sign up for a time to have the information collected on campus in the nutrition assessment laboratory. All participants gave implied consent by completing the consent form before any data were collected (Appendix C).

Instrumentation

Height and weight measurements were taken using the Tanita Bioelectrical Impedance machine. The Tanita body composition analyzer/scale provides a detailed body composition analysis. Measurements included in the Tanita body composition printout include: height, weight, impedance, body fat percentage, body mass index, fat mass, and fat-free mass. Socks and shoes were removed to stand on the apparatus for accurate readings. Subjects were asked to be properly hydrated when having the body composition measurements taken. The Tanita body composition analyzer works by

sending an electrical current from one foot, passing through the body to the other foot. The time it takes for the electrical current to return to the machine is used as a indicator of the amount of body fat. If a person is dehydrated, the electrical current will take longer since water is a conductor of electricity. The result would be a higher body fat percentage than actual. The Tanita bioelectrical impedance machine is found to be accurate within +/- 5 percentage of the Dual Energy X-ray Absorptiometry, the institutional standard of body composition analyzers. When measurements are repeated under the same conditions, +/- 1 percent variation is common.

Lange skinfold calipers were also used to measure body fat. Measurements were taken at the recommended sites for women at the tricep, thigh, and the iliac crest. The right side of the body was measured for consistency. The skin was pinched at the appropriate sites to raise a double layer of skin and the underlying adipose tissue, but not the muscle. The calipers were then applied one centimeter below and at right angles to the pinch. A reading in millimeters was taken two seconds later. Two measurements were taken and the mean was determined. If the two measurements differed greatly, a third measurement was taken and the two most consistent measurements were used to obtain a mean. In this study body fat percentage from the Tanita Body Compositional Analyzer/Scale were used in analysis. (Data collection form for anthropometric measurements is in Appendix D).

The Multidimensional Body-Self Relations Questionnaire (MBSRQ) was the first part of the survey (Appendix E) administered in this study. The MBSRQ helps the researcher to determine the body image of participants. This questionnaire is a 69-item inventory that assesses self-attitudinal aspects of body image (Brown, Cash, & Mikulka,

1990; Cash, 2000). Subjects indicate if they definitely disagree (1), mostly disagree (2), neither disagree nor agree (3), mostly agree (4), and definitely agree (5) with each statement. The MBSRQ is divided into seven subscales (appearance evaluation, appearance orientation, fitness evaluation, fitness orientation, health evaluation, health orientation, and illness orientation) and three special multi-item subscales (body areas satisfaction scale, overweight preoccupation, and self-classified weight). Each of the subscales, associated Cronbach's Alpha score, and reliability are discussed below.

Appearance Evaluation: Measures feeling of physical attractiveness or unattractiveness, and satisfaction or dissatisfaction with ones looks. High scores in this area indicate feelings of satisfaction with appearance; low scores indicate a general unhappiness with physical appearance. Cronbach's Alpha is 0.88 and the one month test-retest reliability is 0.91 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Appearance Orientation: Measures the extent of investment in ones appearance. A high score in this section would mean a person places more importance on how he or she looks, pays attention to his or her appearance, and engages in extensive grooming behaviors. Low scorers are apathetic about their appearance and their looks are not especially important. These people also do not expend much effort to look good. Cronbach's Alpha is 0.85 and the one month test-retest reliability is 0.90 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Fitness Evaluation: Feelings of being physically fit or unfit. High scorers believe themselves to be physically fit, in shape, or athletically active. Low scorers would feel the opposite, believing themselves to be unfit, out of shape, or athletically unskilled. These people also do not value physical fitness or regularly incorporate exercise into their

daily lives as high scorers do. Cronbach's Alpha is 0.77 and the one month test-retest reliability is 0.79 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Fitness Orientation: Looks at the extent of investment of being physically fit. This subscale is similar to fitness evaluation in that high scorers value fitness and are actively involved in activities to enhance or maintain their fitness levels. Low scorers, again, do not value fitness or regularly incorporate fitness into their lives. Cronbach's Alpha is 0.90 and the one month test-retest reliability is 0.94 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Health Evaluation: Feelings of physical health and/or freedom from illness. People who score high in this category believe they are in good health, whereas, low scorers feel unhealthy and experience symptoms of illness. Cronbach's Alpha is 0.83 and the one month test-retest reliability is 0.79 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Health Orientation: The extent of investment in a physically healthy lifestyle. People who score high are health conscious and try to lead a healthy lifestyle. Low scorers are less interested in their health. Cronbach's Alpha is 0.78 and the one month test-retest reliability is 0.85 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Illness Orientation: Measures the extent of reactivity to being or becoming ill (Brown, Cash, & Mikulka, 1990; Cash, 2000). The nature of this study focused more on appearance, fitness, health, and weight; therefore, this subscale was not analyzed.

Body Areas Satisfaction Scale: This is similar to the appearance evaluation subscale, but focuses on satisfaction with discrete aspects of one's appearance. A high scorer is happy with most areas of his or her body. A low scorer would be dissatisfied

with the size or appearance of numerous areas. Cronbach's Alpha is 0.73 and the one month test-retest reliability is 0.74 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Overweight Preoccupation: Measures a construct of reflecting fat anxiety, weight awareness, dieting, and eating restraint. Cronbach's Alpha is 0.76 and the one month test-retest reliability is 0.89 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

Self-Classified Weight: This subscale reflects how a person perceives and label's his or her weight, ranging from very underweight to overweight. Cronbach's Alpha is 0.89 and the one month test-retest reliability is 0.74 (Brown, Cash, & Mikulka, 1990; Cash, 2000).

The second part of the survey consisted of a 24 hour dietary recall (Appendix F) and description of exercise performed in the last week (Appendix G). Subjects were asked to think back 24 hours and record all food and beverages, including alcohol consumed. Amounts of food eaten and time eaten were also recorded. Subjects were asked to be as detailed as possible in the description of the food and the preparation method. In order to help subjects more accurately estimate portion sizes of foods, a large array of food models were provided. Participants were asked to look at the food models and then estimate the amount of food or beverage consumed. Subjects were also asked to record exercise done in the past three days. They were to record the date, type of exercise, length of exercise and finally indicate the intensity level by circling easy, medium, or hard. Subjects determined intensity levels based on their perceptions.

Data Collection Procedures

Anthropometric measurements were taken first. Height was taken using a standard wall mounted height rod. For this, subjects were asked to remove their shoes and

socks to obtain an accurate reading. Weight measurements were taken next using the Tanita Bioelectrical Impedance machine. The Tanita body composition analyzer/scales provides a detailed body composition analysis including weight, impedance, body fat percentage, body mass index, fat mass, and fat-free mass. These measurements were all taken without the inconvenience of more intrusive traditional measurement methods. Subjects again had their shoes and socks removed while standing on the apparatus. The last anthropometric measurement was percent body fat measured using Lange Skinfold Calipers. Skinfold measurements were taken at three sites: right tricep, front right thigh, and iliac crest on right side of body. The skin was pinched at the appropriate site to raise a double layer of skin and the underlying fat tissue, but not the muscle. The calipers were then applied 1 cm below and at right angles to the pinch, and a reading in millimeters (mm) was taken two seconds later. The mean of two measurements was taken. If the two measurements differed greatly, a third skinfold measurement was then taken and then the mean of the two closer measurements was taken. Upon completion of the anthropometric measurements, subjects were then asked to fill out the MBSRQ survey, 24-hour diet recall form, and description of exercise performed in the last three days. Subjects were able to look at food models to estimate portion sizes for the 24- hour diet recall. Upon completion of the survey, subjects were finished with the study and no further information was needed.

Data Analysis

The 24 hour dietary recall was analyzed using the Food Processor SQL nutrition and fitness software. This program has a database of more than 35,000 foods, recipes and exercises from a variety of sources. Foods were entered by hand into the program and

matched as closely as possible to food items in the system. Analyses of the total calories, protein, carbohydrates, total fat, and saturated fat, were then calculated for the 24 hour period.

Total amount of exercise was grouped into easy/medium intensity and total intensity. The amount of exercise per week was estimated based on the amount of exercise for the past three days. This amount was then compared to the national recommendations of 150 minutes a week of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week (U.S. Department of Health & Human Services, 2008).

Descriptive statistics were run on all variables. A Pearson r correlation was calculated between each of the ten MBSRQ subscales and each dietary component. However, correlation data were only reported for nine subscales as illness orientation did not directly apply to the objective of the study. Data collected from the MBSRQ survey were computed using the MBSRQ User's manual. A Pearson r correlation was also run for exercise and each dietary component and MBSRQ subscale; body fat percentage and MBSRQ subscales, dietary intake, exercise; and tricep skinfold percentile and the MBSRQ subscales. T-tests were run for BMI categories (normal weight and overweight/obese) and MBSRQ subscales, dietary intake, and exercise to determine if differences between group means exist. Crosstabs and chi-squares were run between each of the nine MBSRQ subscales and each dietary component. The subscale scores were categorized into two groups with scores of 1-2.9 and greater than 3, while the dietary components were also categorized (0-89% of required intake, 90-110% of dietary intake, and greater than 110% of intake). Analysis of variance was run for age and each MBSRQ

subscales, dietary components, and estimated weekly minutes of exercise at easy/medium intensity and hard intensity. All statistics were analyzed using the Statistical Package for Social Sciences 16.0 (SPSS 16.0). Unless otherwise noted statistical significance was judged using a significance level of $p \leq 0.05$ and two-tailed tests (where appropriate).

Chapter IV: Results

The purpose of this study was to determine if there was a relationship between macronutrient intake, exercise, and body image among female undergraduate college students at a small Midwestern University. Data were gathered from anthropometric measurements, the MBSRQ survey, a 24-hour diet recall, and three day exercise log. Within this chapter, demographic, anthropometric characteristics, dietary intake, exercise levels, and frequencies of the MBSRQ subscales are reported. Correlations between the different variables, differences between group means, and other findings are reported.

Item Analysis

All subjects consenting to participate were female college undergraduate students (N=86). Three subjects chose not to fill out the MBSRQ survey or parts of the survey. They were excluded only from analysis of the parts not answered. The mean age was 19.85 ± 1.63 years old, with a range of 18 to 25. The average grade level in school of subjects was reported to be sophomore year. Scores were calculated for each of the nine subscales selected from the MBSRQ. The reported mean of the appearance evaluation subscale was 3.39. Scores ranged from 1.4 to 5.0 for appearance evaluation (Figure 1). The second subscale, appearance orientation, had a slightly higher mean of 3.45. The range, 1.9 to 4.5, was somewhat tighter than the appearance evaluation scores range (Figure 1). Fitness evaluation and fitness orientation scores reported had the same range of a 1.3 to 5.0. The average score was higher for fitness evaluation than fitness orientation with a score of 3.79 and 3.61, respectively. Frequencies can be seen in Figure 1.

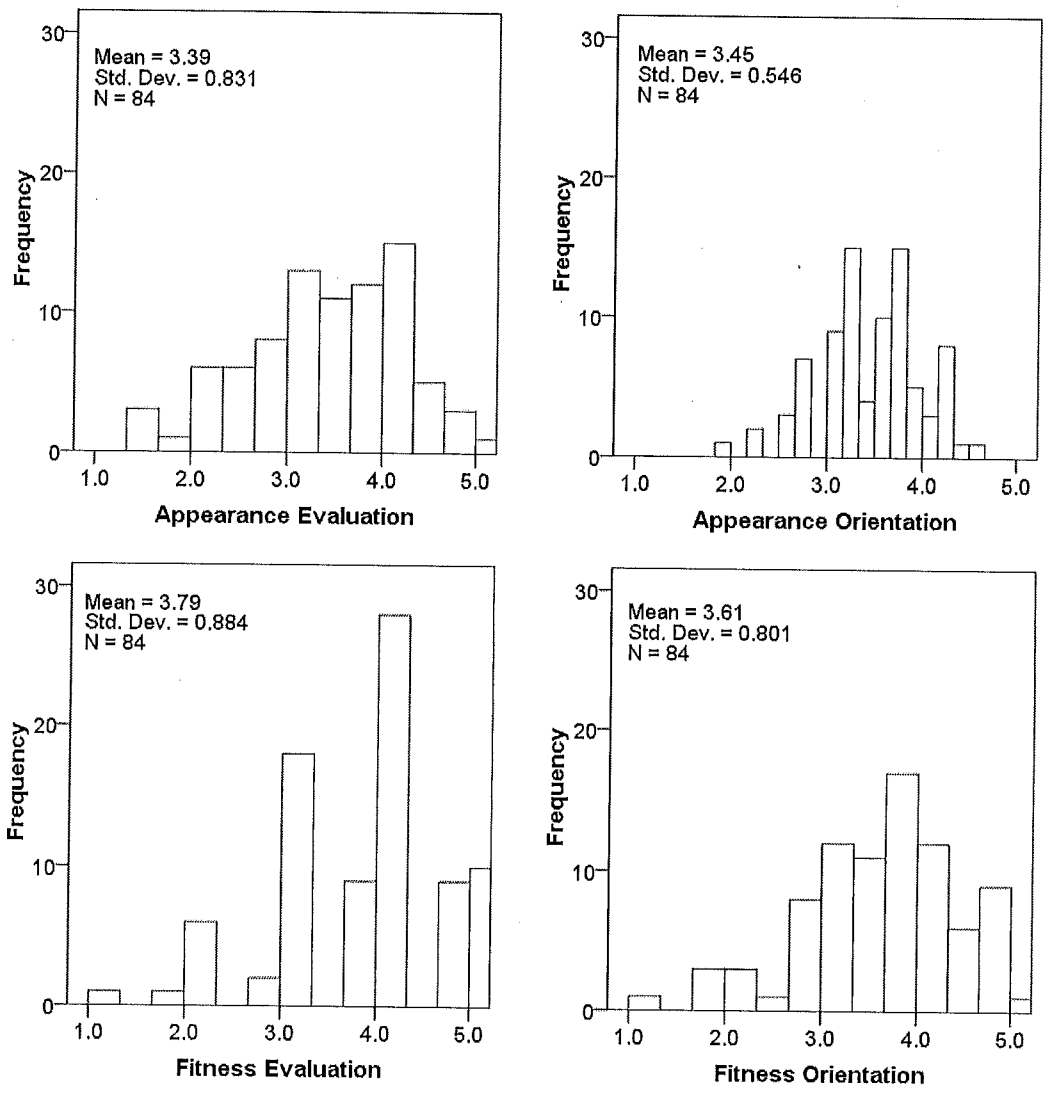

Figure 1. Frequencies, means, and standard deviation for the appearance evaluation, appearance orientation, fitness evaluation and fitness orientation MBSRQ subscales. Subjects answered questions for each subscale on a scale of one to five. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

The mean score reported for the health evaluation subscale was 3.72 ± 0.63. Ranges were slightly larger (1.8 – 5.0) than for the health orientation subscale (1.8 – 4.8), as seen in Figure 2. The mean score calculated for the health orientation was 3.48. Figure 2 also shows the frequency, mean, standard deviation, and number of subjects for the remaining subscales, body

areas satisfaction scale, overweight preoccupation, and self-classified weight. Means for body areas satisfaction scale were slightly lower at 3.34. The mean score for overweight preoccupation (2.55) was the lowest out of any of the subscales. The final subscale of the MBSRQ, self-classified weight, had a calculated mean of 3.18.

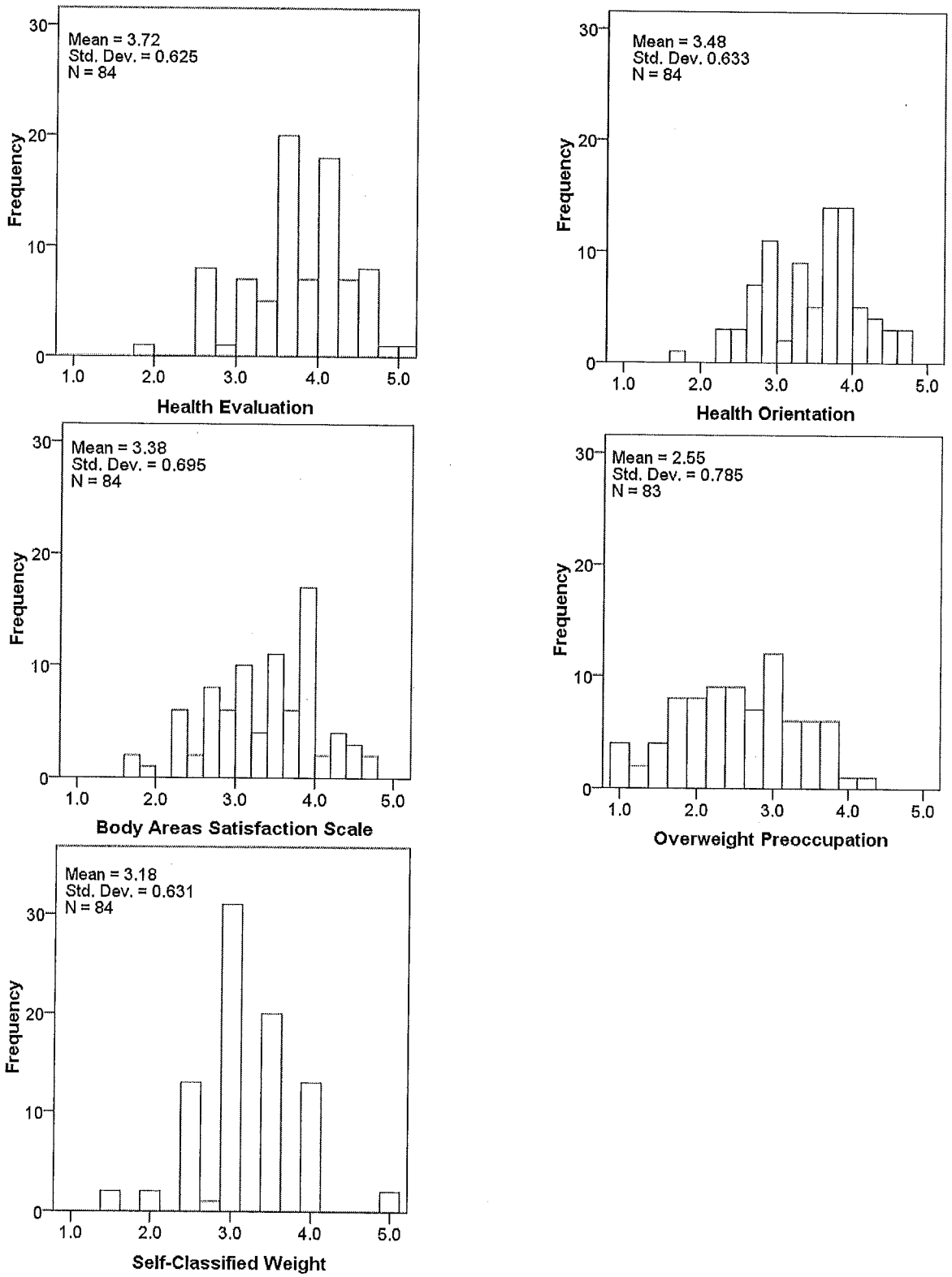

Figure 2. Frequencies, mean, and standard deviation on the health evaluation, health orientation, body areas satisfaction scale, overweight preoccupation, and self-classified weight MBSRQ subscales. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

As shown in Figure 3 the mean percent of dietary recommendations met varied. Protein had the highest percent of the recommended amount compared to any other nutrient with a reported range of 27.51% to 303.12%. Ranges for each dietary component were quite large. Although the average caloric intake was 89.8% of the recommended amount, subjects consumed as little as 28.66% to 208% of the recommended calorie level. Carbohydrate intake had a smaller range of intake than protein with subjects consuming 19.51% to 219%. Intake of total fat, saturated fats, had a large range with values as low as 19.16% of recommended intake of total fat to as high as 449.44% of saturated fat intake.

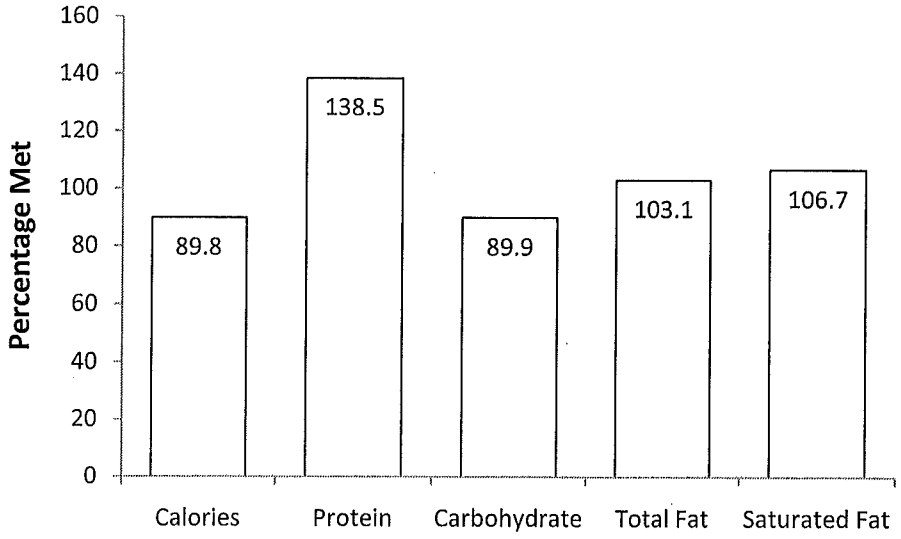

Figure 3. Percent met of recommended dietary allowance (RDA) calories, protein, carbohydrate, total fat, and saturated fat. Note: A percent over 100 indicates an intake higher than the recommended values.

Subjects reported number of days exercised out of three days (Figure 4), as well as number of minutes exercised at an easy, moderate, or intense level based on how intense they believed the activity to be. Out of the total number of subjects participating in this study, at least 83.7% exercised a minimum of one day; however, 41.86% of subjects exercised less than 60

minutes in the past three days. The average number of days for exercising was 1.7 days. Out of those subjects reporting easy intensity exercise in the past three days, 34.07 minutes was the average amount of time spent exercising with a standard deviation of 114.93. The range varied extensively from zero minutes to a total of 960 minutes. The average time spent exercising in the past three days increased to 51.6 ± 76.0 minutes at a moderate intensity with again a large range of zero to 445 minutes. Exercise at a hard intensity averaged at 34.4 ± 60.7 minutes within the past three days. The mean total number of minutes exercised in the past three days was 119.62 ± 153.89 with the median total at 72.5 minutes. An estimated amount of time at easy/moderate and hard intensity per week was calculated at 199.8 ± 336.0 and 79.3 ± 141.0, respectively. Out of the subjects participating, 45.35% did not exercise either 150 minutes at a moderate intensity or 75 minutes at a vigorous intensity.

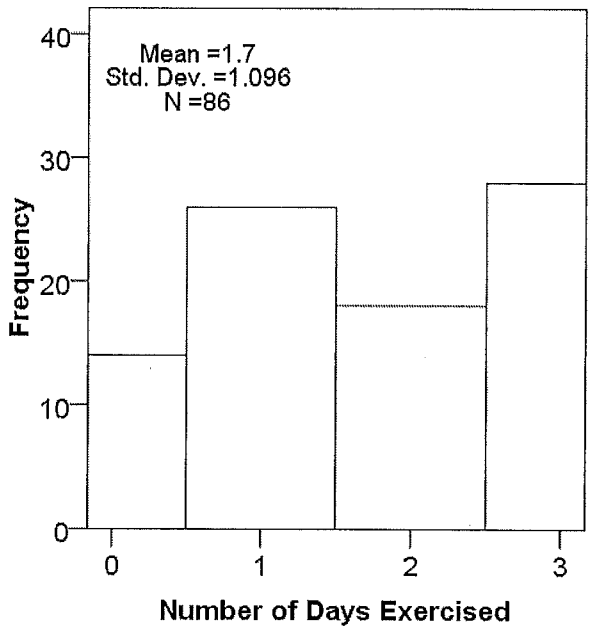

Figure 4. Total number of days exercised by subjects indicated on three day exercise log.

BMI was calculated using the Tanita bioelectrical impedance machine. The average BMI of subjects was 23.3 kg/m^2, with a range of 17.4 to 38.6 kg/m^2. Subjects were categorized based

on their BMI: less than 18.5 kg/m^2 is considered underweight, 18.5 – 24.9 kg/m^2 is a normal weight, 25 – 29.9 kg/m^{2}is classified as overweight, and greater than 30 is considered obese. The frequencies of BMI categories can be seen in Figure 5. The majority of subjects (N = 66) were considered to have a normal weight based on the calculated BMI.

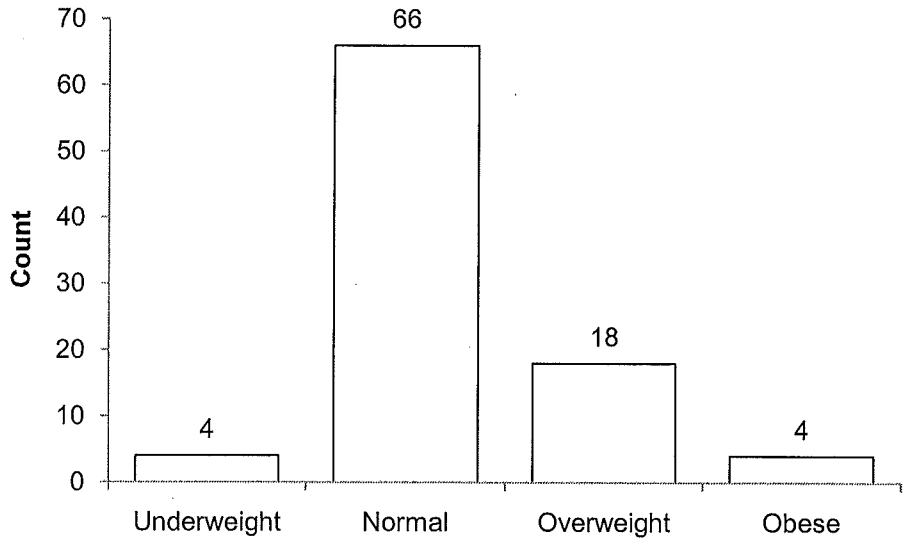

Figure 5. BMI of undergraduate female students. Underweight is considered less than 18.5 kg/m^2, normal weight is considered 18.5 – 24.9 kg/m^2, overweight is considered 25 – 29.9 kg/m^2, and obese is a BMI of greater than 30 kg/m^2.

Tricep skinfolds were taken and categorized based upon national percentiles as shown in Figure 6. A tricep skinfold measurement of 11.4 mm would fall within the 5th percentile, meaning that 95% of people have a skinfold measurement larger than 11.4 mm. No individuals fell below the 5th percentile. A measurement of 36.1 mm would fall within the 95th percentile, meaning that 95$^{\%}$ of people would have a lower skinfold measurement. One subject could not be placed into a category because percentiles for tricep skinfold measurements at the higher level (greater than 31.5) for 18 year old females have not been found reliable. The most frequent

category for participants was the $16^{th} - 25^{th}$ percentile with 23 individuals, followed by the $51^{st} - 75^{th}$ percentile with 17 individuals.

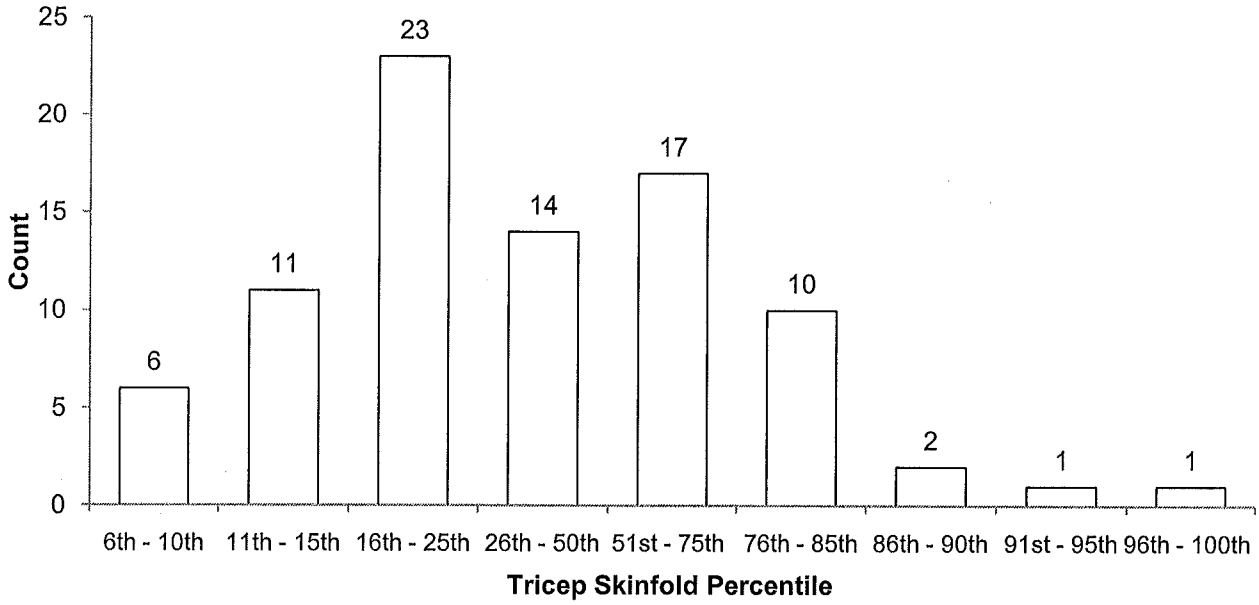

Figure 6. Tricep skinfold percentile of subjects. Note: A tricep skinfold measurement of 11.4 mm would fall within the 5^{th} percentile, meaning that 95% of people have a skinfold measurement larger than 11.4 mm. A measurement of 36.1 mm would fall within the 95^{th} percentile, meaning that $95^{\%}$ of people would have a lower skinfold measurement.

T-tests were run in order to determine if there were any differences in the group means of normal weight and overweight individuals determined by BMI and MBSRQ subscales. There were not enough subjects in the lower weight category; therefore, it was removed for this test. Obese individuals were combined with the overweight individuals because obese individuals also had a weight higher than the normal weight. Table 1 shows means, t-test value, degrees of freedom, and significance. Significance was found between BMI means and means of all the subscales except for the appearance orientation, and fitness evaluation, ($p \leq 0.05$, $p \leq 0.01$). The most significant findings were the difference between means of the normal weight and overweight groups on the appearance evaluation and the self-classified weight subscale. T-tests

were also performed for BMI and dietary intake. No significant results were found for BMI and dietary intake ($p \leq 0.05$).

Table 1

A comparison of Group Mean Scores for the MBSRQ Subscales for College Students' BMI (Normal and Overweight) using 2-tailed Significance T-test.

Subscales	Normal Weight Mean ± SD	Overweight Mean ± SD	t	df	Sig. (2-tailed)
Appearance Evaluation	3.56 ± 0.72	2.87 ± 0.94	3.46	78	.001**
Fitness Orientation	3.74 ± 0.77	3.34 ± 0.84	2.02	78	.047*
Health Evaluation	3.85 ± 0.61	3.40 ± 0.59	2.96	78	.004**
Health Orientation	3.62 ± 0.59	3.18 ± 0.66	2.90	78	.005**
Body Areas Satisfaction	3.53 ± 0.67	2.99 ± 0.68	3.27	78	.002**
Overweight Preoccupation	2.47 ± 0.71	2.88 ± 0.88	-2.12	77	.037*
Self-Classified Weight	3.00 ± 0.46	3.84 ±0.50	-7.18	78	.001**

Note. n = 84 for all correlations between body fat percentage and subscales except for the overweight preoccupation subscale, where n = 83.

* $p \leq 0.05$, 2-tailed. ** $p \leq 0.01$, 2-tailed.

Analysis of variance was performed to determine if there were any differences between groups or within groups when comparing age and the MBSRQ subscales, age and dietary intake variables, and finally age and estimated minutes of exercises weekly. Several cross tabulations between MBSRQ subscales and dietary intake variables were performed where the Pearson Chi-Square and Fischer's Exact Test were calculated. When dividing data for the MBSRQ subscales,

two groups were formed, a score of 1 – 2.9 (definitely to mostly disagreeing) and a score of 3 – 5 (neither disagreeing nor agreeing to definitely agreeing). Dietary intakes were categorized based on percent of recommended value met. Categories included 0 – 89% of intake, 90 – 110%, and greater than 110%. Lower carbohydrate intake was found to be associated with higher appearance evaluation scores as evaluated by chi-square ($p = 0.005$). With higher protein intake, higher scores on the fitness evaluation were found as evaluated by Fischer's Exact test ($p = 0.027$).

Pearson correlations were performed to determine if any positive or negative relationships existed between the MBSRQ subscales and the different dietary components (Table 2). No significant relationships were found between the appearance evaluation subscale and any of the dietary components ($p \leq 0.05$). A negative correlation existed between the appearance orientation subscale and protein intake ($r = -.251$, $p \leq 0.05$). The correlation graph (Figure 7) depicted each subject's scores for the appearance orientation subscale and protein intake. A score of one indicated definitely disagree with the statement, two indicated mostly disagree, three indicated neither disagree nor agree, four indicated mostly agree, and five indicated definitely agree with the statement.

Table 2

Correlations between Appearance Evaluation and Orientation Subscales and Dietary Intake

Macronutrient	Pearson r Correlation Appearance Evaluation	Pearson r Correlation Appearance Orientation
	n = 84	
Calories	-.140	-.088
Protein	.075	-.251*
Carbohydrate	-.161	-.052
Total Fat	-.070	-.058
Saturated Fat	-.077	-.039

* $p \leq 0.05$, 2-tailed.

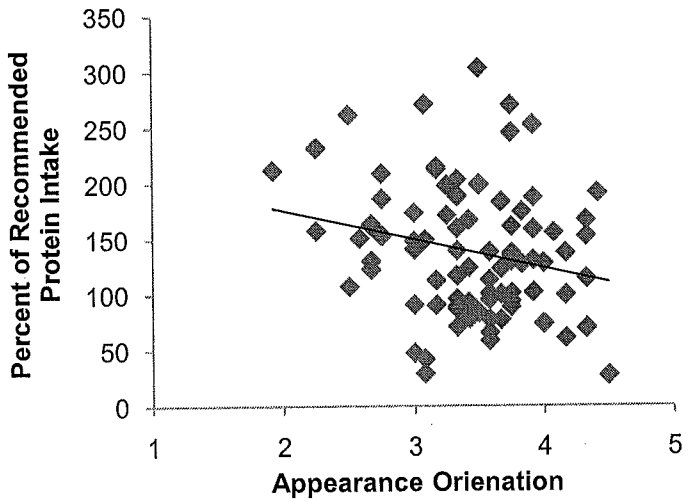

Figure 7. Correlation graph of the percent of recommended protein intake met and the appearance orientation subcale scores. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

Pearson r correlations between diet and fitness evaluation and fitness orientation are found in Table 3. No significant correlations were found between the dietary components and the fitness evaluation subscale ($p \leq 0.05$). The percent of recommended total fat intake met was

significantly inversly related to fitness orientation ($r = -.221$, $p \leq 0.05$). As shown in Figure 8, higher scores on the fitness orientation subscale were associated with lower intakes of total fat.

Table 3

Correlations between Fitness Evaluation and Orientation Subscales and Dietary Intake

Macronutrient	Pearson r Correlation Fitness Evaluation	Pearson r Correlation Fitness Orientation
	n = 84	
Calories	-.180	-.084
Protein	.007	.076
Carbohydrate	-.153	.026
Total Fat	-.157	-.221*
Saturated Fat	-.052	-.096

* $p \leq 0.05$, 2-tailed.

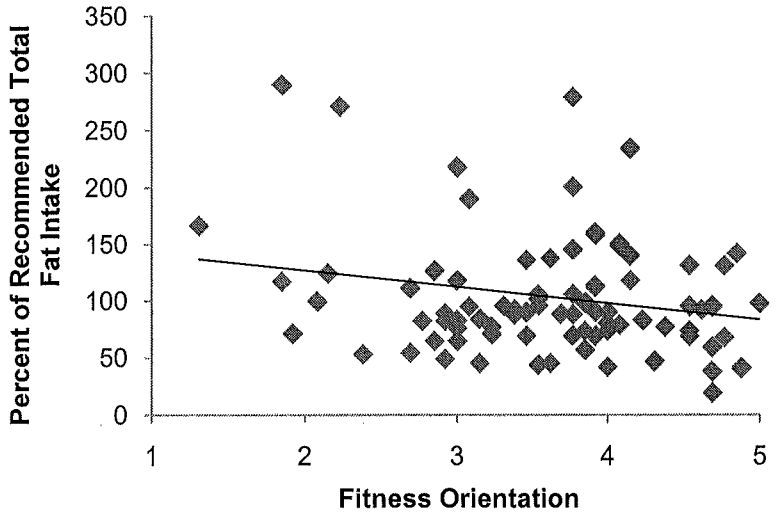

Figure 8. Correlation graph of the percent of recommended total fat intake met and the fitness orientation subcale scores. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

Several negative correlations were found when evaluating the health evaluation subscale and the diet (Table 4). Calorie intake had a tendency to be negatively correlated to the health evaluation subscale ($p = 0.054$). Figure 9 shows the inverse relationships between the significantly correlated dietary components and health evaluation. The correlation between health evaluation and the total fat intake was negative, as shown in Figure 9 ($r = -.240$, $p \leq 0.05$). Finally, health evaluation was also found to be negatively linked to saturated fat intake ($r = -.247$, $p \leq 0.05$).

Table 4

Correlations between Health Evaluation Subscale and Dietary Intake

Macronutrient	Pearson r Correlation	P-value
	n = 84	
Calories	-.212	.054
Protein	-.109	.327
Carbohydrate	-.120	.278
Total Fat	-.240*	.028
Saturated Fat	-.247*	.023

* $p \leq 0.05$, 2-tailed.

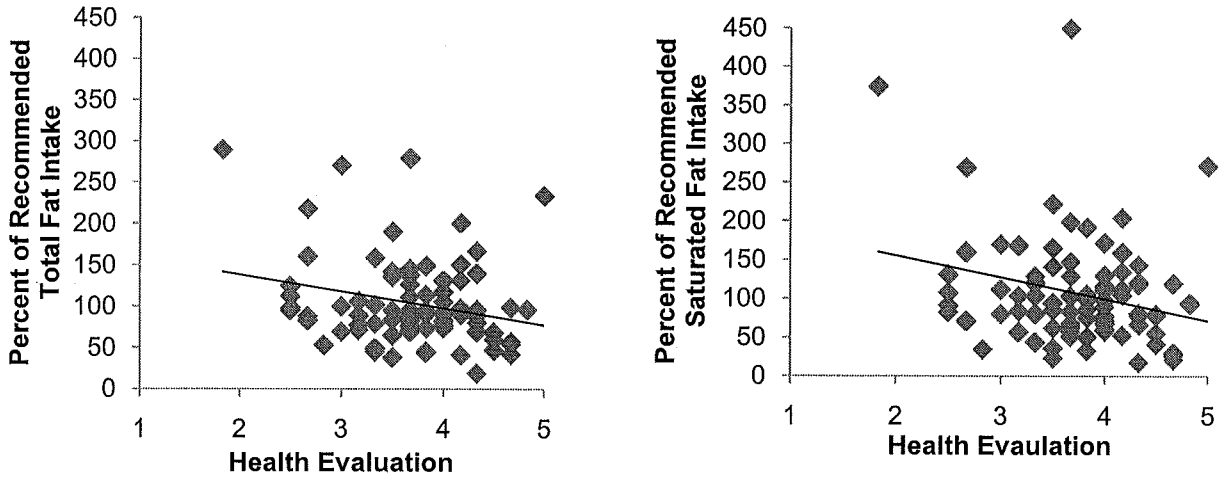

Figure 9. Correlation graphs of the percent of recommended total fat and saturated fat, intakes met and the health evaluation subcale scores. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

The next subscale in which correlations were calculated was health orientation at the $p \leq 0.05$ level (Table 5). Calories, total fat, and saturated fat were all found to be negatively correlated to health orientation scores ($r = -.222$, $p = 0.44$; $r = -.254$, $p = 0.02$; $r = -.218$, $p = 0.046$, respectively). Correlation graphs showing actual data plotted for the significantly correlated dietary components and health orientation scores are found in Figure 10.

Table 5

Correlations between Health Orientation Subscale and Dietary Intake

Macronutrient	Pearson r Correlation	P-value
	n = 84	
Calories	-.222*	.044
Protein	-.005	.964
Carbohydrate	-.158	.152
Total Fat	-.254*	.020
Saturated Fat	-.218*	.046

* $p \leq 0.05$, 2-tailed.

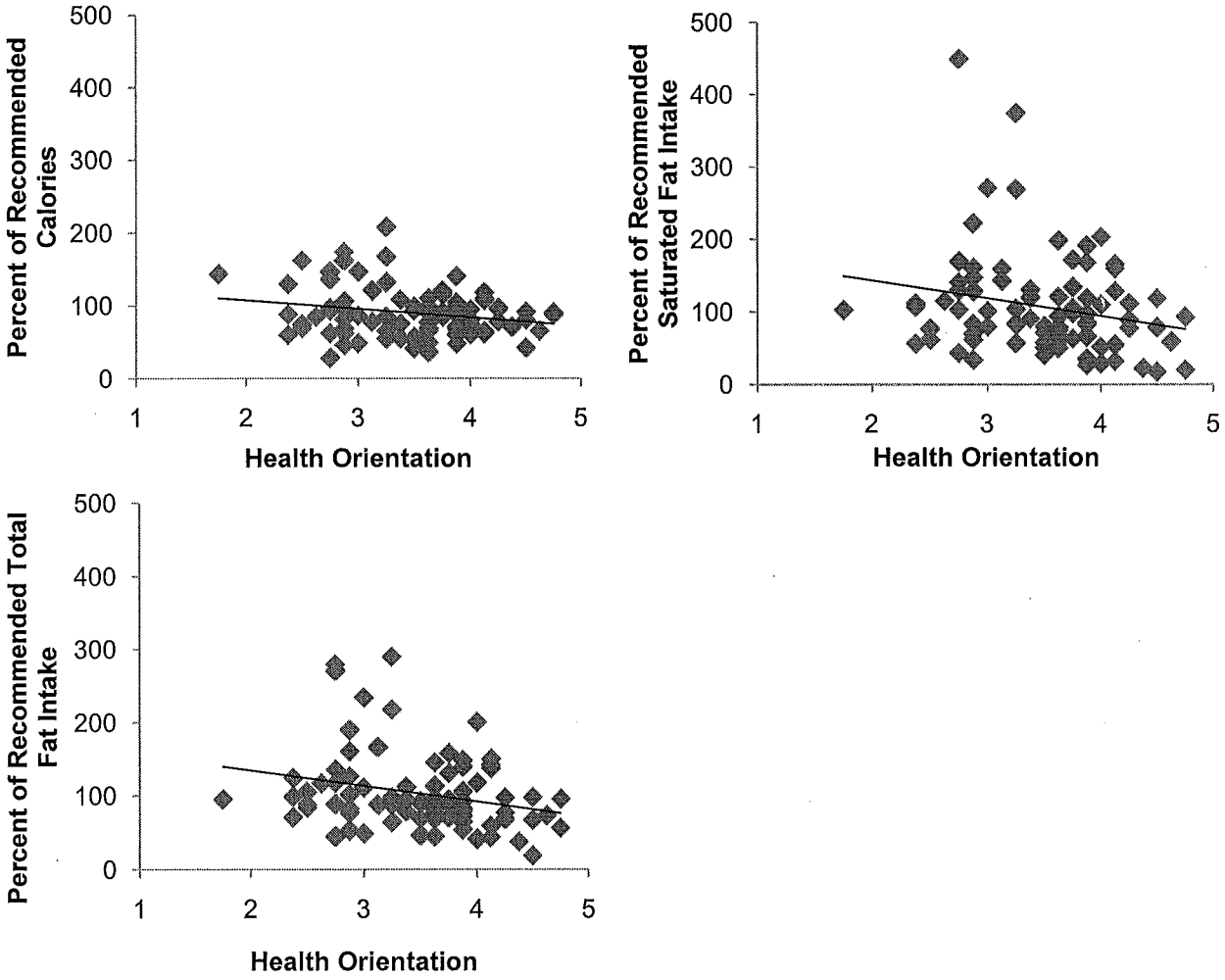

Figure 10. Correlation graphs of the percent of recommended calories, total fat, and saturated fat intakes met and the health orientation subcale scores. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

A significant ($p \leq 0.05$) negative association between the body area satisfaction scale and caloric intake and carbohydrate intake was found (Table 6). The Pearson r correlation coefficient for calories and body area satisfaction scale (BASS) was calculated at r = -.220, and r = -.237 for calories and carbohydrate intake, respectively. Correlation graphs showing actual data plotted for the significantly correlated dietary components and BASS scores are found in Figure 11.

Table 6

Correlations between Body Areas Satisfaction Scale and Dietary Intake

Macronutrient	Pearson r Correlation	P-value
	n = 84	
Calories	-.220*	.046
Protein	-.035	.755
Carbohydrate	-.237*	.030
Total Fat	-.128	.247
Saturated Fat	-.133	.228

* $p \leq 0.05$, 2-tailed.

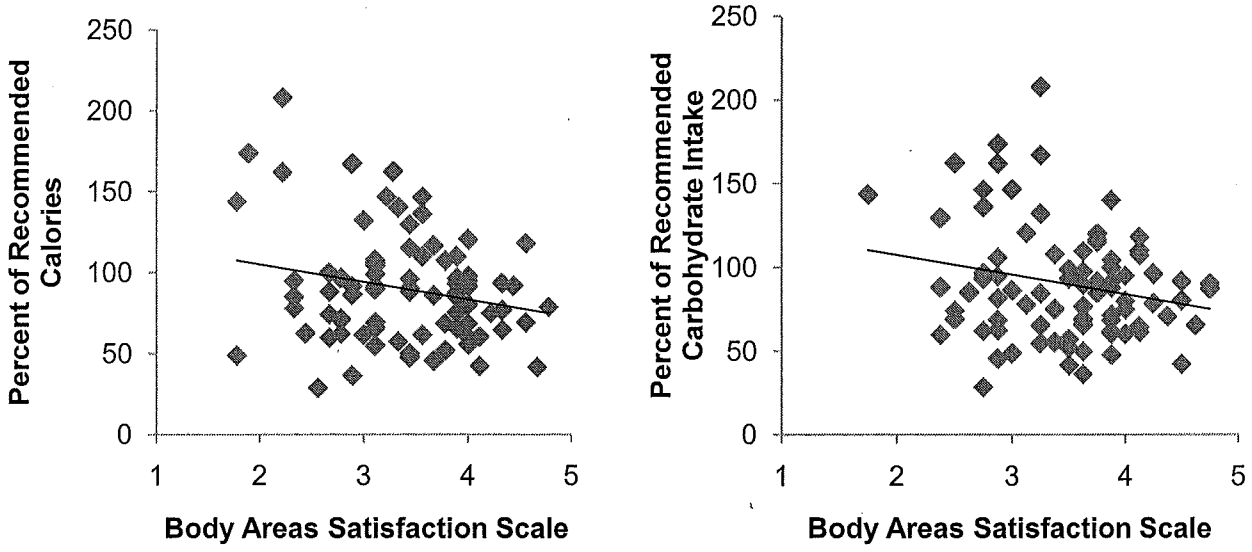

Figure 11. Correlation graphs of percent of the recommended carbohydrate and calorie intake met and body areas satisfaction scale. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement

Pearson r correlation was performed for the dietary components and both the overweight preoccupation and the self-classified weight subscale (Table 7). A score of one indicated definitely disagree with the statement, two indicated mostly disagree, three indicated neither disagree nor agree, four indicated mostly agree, and five indicated definitely agree with the statement. No significant correlations were found between overweight preoccupation or self-classified weight and the dietary components.

Table 7

Correlations between Overweight Preoccupation and Self-Classified Weight Subscales and Dietary Intake

Macronutrient	Pearson r Correlation Overweight Preoccupation	Pearson r Correlation Self-Classified Weight
	n = 83	n = 84
Calories	.059	.066
Protein	-.122	-.177
Carbohydrate	.082	.082
Total Fat	-.002	.001
Saturated Fat	.046	-.010

* $p \leq 0.05$, 2-tailed.

The relationship between body fat percentage and BMI and the MBSRQ subscales were calculated using Pearson r correlation. Several correlations were found as noted in Table 8. Body fat percentage was found to be negatively associated to appearance evaluation (r = -.519), fitness orientation (r = -.289), health evaluation (r = -.286), health orientation (r = -.299), and BASS (r = -.389) at a significance level of

$p \leq 0.01$. Significant positive correlations between body fat percentage and both the overweight preoccupation and self-classified weight subscales were found at a significance level of $p \leq 0.01$. Significant positive correlations between body fat percentage and both the overweight preoccupation ($r = .407$) and self-classified ($r = .746$) weight subscales were found at a significance level of $p \leq 0.01$. BMI was found to be negative associated to appearance evaluation ($r = -.479$), fitness orientation ($r = -.296$), health evaluation ($r = -.321$), and BASS ($r = -.387$) at a significance level of $p \leq 0.01$, and health orientation ($r = -.229$) at the $p \leq 0.05$.

Table 8

Correlations between Body Fat Percentage and BMI and MBSRQ Subscales

Subscales	Pearson r Correlation Body Fat Percentage	Pearson r Correlation BMI
Appearance Evaluation	-.519**	-.479**
Appearance Orientation	.134	.026
Fitness Evaluation	-.193	-.205
Fitness Orientation	-.289**	-.296**
Health Evaluation	-.286**	-.321**
Health Orientation	-.299**	-.229*
Body Areas Satisfaction Scale	-.389**	-.387**
Overweight Preoccupation	.453**	.407**
Self-Classified Weight	.739**	.746**

Note. n = 84 for all correlations between body fat percentage and subscales except for the Overweight Preoccupation subscale, where n = 83.

* $p \leq 0.05$, 2-tailed. ** $p \leq 0.01$, 2-tailed.

Correlations were also calculated between body fat percentage of subjects and dietary intake (Table 9). Only one significant correlation was found. A negative correlation between body fat percentage and protein intake was found at the $p \leq 0.05$ level ($r = -.234$). Graphical representation of this correlation can be seen in Figure 12.

Table 9

Correlations between Body Fat Percentage and Dietary Intake

Macronutrient	Pearson r Correlation	P-value
	n = 86	
Calories	.093	.394
Protein	-.234*	.030
Carbohydrate	.077	.479
Total Fat	.070	.520
Saturated Fat	.155	.154

* $p \leq 0.05$, 2-tailed.

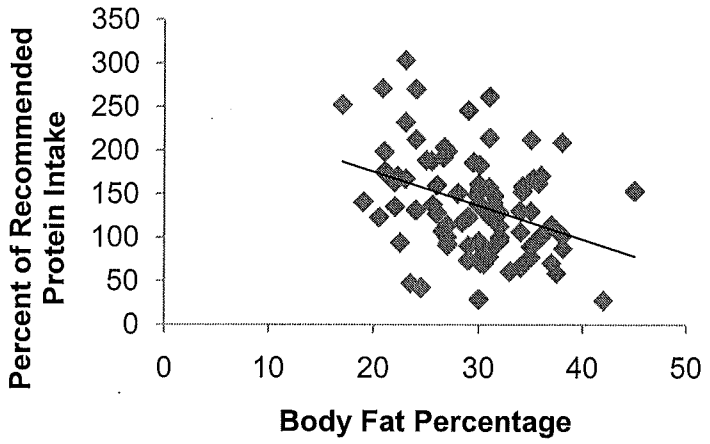

Figure 12. Correlation graph between percent of recommended protein intake met and the body fat percentage of female college students. 1 = definitely agree, 2 = mostly agree, 3 = neither disagree nor agree, 4 = mostly agree, and 5 = definitely agree with the statement.

Other correlations calculated in this study were associations between the different MBSRQ subscales (Appendix H) and exercise levels (Appendix I), and dietary intake and exercise (Appendix J). Numerous significant correlations were found between the MBSRQ subscales at either $p \leq 0.05$ or $p \leq 0.01$. Appearance evaluation seemed to be related to every other subscale except for the appearance orientation subscale. The only subscale that appearance orientation was associated with was the overweight preoccupation subscale where a significant positive correlation was found. Fitness evaluation was also found to be significantly correlated with all but two subscales of the MBSRQ, appearance orientation, and overweight preoccupation. Correlations between fitness orientation and the other subscales were identical in direction and similar in significance levels to correlations between fitness evaluation and the other subscales. Health evaluation was positively correlated to health orientation, body areas satisfaction, appearance evaluation, fitness evaluation, and fitness orientation at the $p \leq 0.01$ level, and negatively correlated with overweight preoccupation and self-classified weight at the $p \leq 0.05$ level. The remaining subscales had some positive or negative correlations to other subscales.

The amount of exercise subjects performed was significantly correlated to a number of MBSRQ subscales at either the $p \leq 0.05$ or $p \leq 0.01$ level (Appendix I). A score of one on the subscales indicated definitely disagree with the statement, two indicated mostly disagree, three indicated neither disagree nor agree, four indicated mostly agree, and five indicated definitely agree with the statement. Appearance evaluation and appearance orientation were not significantly related to any amount of

exercise. Four subscales (fitness evaluation, fitness orientation, health evaluation, health orientation) were related positively to the number of days exercised.

Correlations between the dietary intake and exercise can be found in Appendix J. Very few significant correlations were found. A negative correlation was found between both total fat and saturated fat intake and the total number of minutes exercised at a moderate intensity level ($r = -.255$, $r = -.214$ respectively at a $p \leq 0.05$ level). Graphical representations of significant correlations may be found in Figure 13.

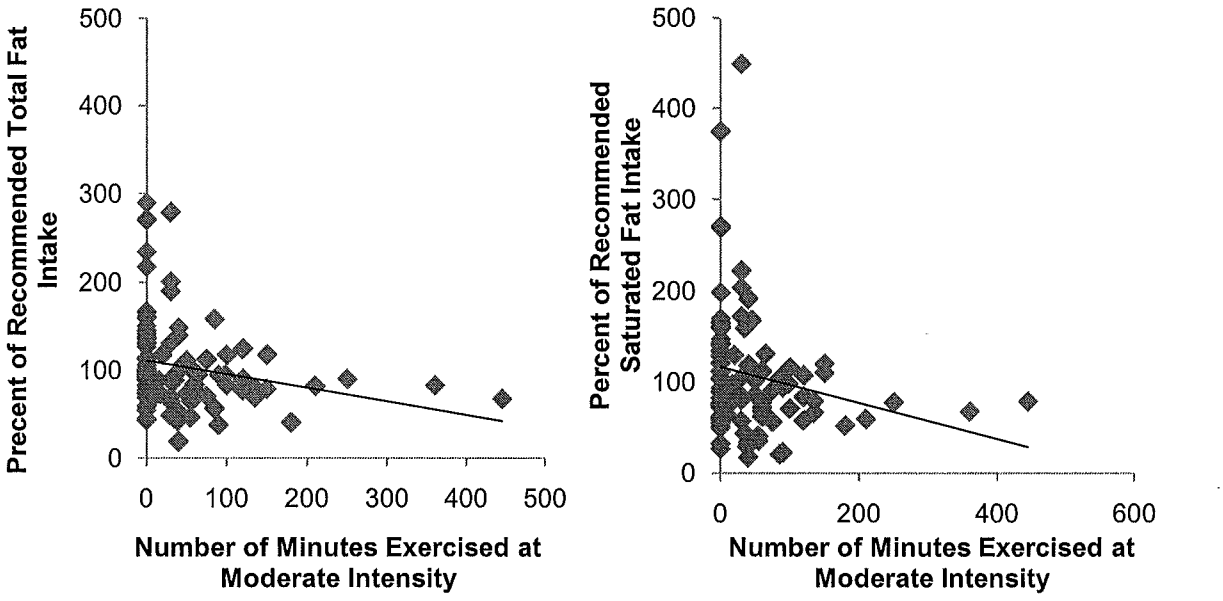

Figure 13. Correlation graph of the percent of recommended total fat and saturated fat intake met and the number of minutes exercised at a moderate intensity level.

Conclusion

Results of this study showed that there was a correlation between body image and macronutrient intake among female college students. Some correlations include protein intake negatively correlated with appearance orientation and total fat negatively correlated with fitness

orientation. Several statistically significant correlations existed between body image assessment and physical activity levels among female college students. Fitness evaluation and fitness orientation were related to the number of days exercised and varying intensities.

Statistically significant correlations were found between body image and body fat percentage among female college students. A negative association between appearance evaluation, fitness orientation, health orientation, and body areas satisfaction scale and body fat percentages was noted, while a positive correlation with overweight preoccupation and self-classified weight was noted. Numerous statistically significant correlations between different the body image assessment scales of the MBSRQ were found.

Statistically significant differences were found between group means of BMI and body image among female college students. Normal weight individuals based on the BMI had a higher appearance evaluation, fitness orientation, health evaluation, health orientation, and body areas satisfaction score compared to those that were overweight. A lower score on the overweight preoccupation and self-classified weight subscales were found in the normal weight group. The significance of these findings will be discussed in Chapter 5.

Chapter V: Discussion

The purpose of this study was to determine if there was a correlation between macronutrient intake and body image among female undergraduate college students. Data was collected Midwestern University during the spring of 2009 through the use of the Multidimensional Body-Self Relations Questionnaire and anthropometric measurements. In addition, a 24 hour diet recall, and description of exercise patterns and intensities were collected to determine the macronutrient intake and physical activity level. This study examined whether the impact of macronutrient (carbohydrate, protein and fat) intake on body image among female college undergraduate students was significant. This chapter includes limitations of this study, discussion of the results of this study in comparison to other research, conclusions which may be drawn from this research, and finally, recommendations for further research.

Discussion

Subjects participating in this study filled out the MBSRQ. This questionnaire was designed to examine self-attitudinal aspects of body image. For each question subjects were asked to determine if they definitely disagreed (1), mostly disagreed (2), neither disagreed nor agreed (3), mostly agreed (4), or definitely agreed (5) with the statements. Frequencies of each subscale can be found in Figures 1 and 2. According to the MBSRQ user's manual (Cash, 2000), a higher score would indicate feelings of physical attractiveness and satisfaction with ones look. A comparison for studies using the MBSRQ is found in Table 10. The mean (3.39 ± 0.831) from this study was higher than a study of 803 adult women (2.93 ± 0.50) in the United States taken in 1993 (Cash & Henry, 1995). The higher mean indicates subjects in the current study are more satisfied with appearance. Another study by Cash et al. (2004), found college students studied between 1999 and 2001 had a mean score of 3.51 ± 0.72 for the appearance evaluation. The next

subscale measured was the appearance orientation. This differs slightly from the appearance evaluation in that this subscale determines the extent of investment in appearance. A mean score of 3.45 ± 0.546 indicated a slight higher importance placed upon how one looks by these students with a slight increase in the engagement of grooming behaviors. Cash et al. noted a similar mean score of 3.52 ± 0.65 for the appearance orientation subscale of college students studied between 1999 and 2001. The body areas satisfaction scale has a stronger emphasis on specific aspects of one's appearance compared to the appearance evaluation subscale. Low scorers tend to be unhappy with the appearance of certain areas on the body. The mean score in this study was reported to be 3.38 ± 0.695 indicating a slight degree of satisfaction with certain areas on the body. Cash and Henry found a lower mean body areas satisfaction scale score of 2.85 ± 0.91, indicating an increased unhappiness with the size or appearance of several areas compared to subjects in the current study. Another study found an overall score on the body areas satisfaction scale of 3.61 ± 0.80 (Cash et al., 2004). One reason for this higher mean score may be that college women evaluate self worth more on achievements instead of appearance.

Overweight preoccupation examines prevalence of dieting, fat anxiety, eating restraint and weight awareness. High scorers tend to be more preoccupied with weight, have a higher degree of anxiety, and a higher frequency of dieting. A mean score of 2.55 ± 0.785 for students in the present study indicated less weight preoccupation, less frequency of dieting, and less overall anxiety related to weight. The mean score in the current study was lower than the mean, 3.23 ± 0.74, found by Cash and Henry (1995), indicating a lower preoccupation of weight among subjects in the current study. Cash et al. noted a mean score of 2.68 ± 0.98 on the overweight preoccupation subscale for college students studied between 1999 and 2001. This mean is very close to the mean found in the current study of 2.55. The final subscale is self-classified weight

in which subjects were asked questions relating to their perceived weight. A high score indicated the belief of being overweight compared to low scorers perceiving themselves to be underweight. The mean was 3.18 ± 0.631 indicating most subjects considered themselves to be of normal weight.

Table 10

Comparison of Means from the MBSRQ Subscales among Studies

Subscale	Current Study	Cash and Henry (1995)	Cash et al. (2004)
Appearance Evaluation	3.39 ± 0.831	2.93 ± 0.50	3.51 ± 0.72
Appearance Orientation	3.45 ± 0.546	------	3.52 ± 0.65
Body Areas Satisfaction	3.38 ± 0.695	3.23 ± 0.74	------
Overweight Preoccupation	2.55 ± 0.785	2.85 ± 0.91	2.68 ± 0.72

Fitness evaluation determines how physically fit or unfit a person is. Low scorers tend to be more unfit and high scorers tend to be fit. With a mean score of 3.79 ± 0.884, the subjects in the present study believed themselves to be more fit than unfit. A mean score of 3.61 ± 0.801 for the fitness orientation subscale indicated a higher level of investment in being physically fit or competence in athletics. Lower scorers tend to not exercise as regularly. Health evaluation questions measured feelings of physical health and the absence of physical illness. A mean score of 3.72 ± 0.625 showed a tendency towards more subjects feeling healthy. Health orientation measures the extent of investment in a physically healthy lifestyle. High scorers are more aware of and apt to partake in healthy behaviors (Brown, Cash, & Mikulka, 1990; Cash, 2000). The

mean score in this study was 3.48 ± 0.633, indicating a slight tendency for participation in healthy behaviors.

Dietary intake of nutrients varied greatly. Recommendations for nutrient intake calculated by the Food Processor SQL software are based upon a number of factors including age, height, weight, and physical activity level. Subjects' recommendations did vary, but data were comparable between subjects based on what percent of the recommendations was met. Calorie consumption was slightly low with a mean intake of 89.9%. This may be due to the busy lifestyle that many college students experience. It is common to not have a consistent routine day to day. Protein intake was the highest among all nutrients studied. Carbohydrate intake was slightly low with a mean of 89.9% of recommended value. This was to be expected because total calorie intake was slightly low. Most of the calories consumed came from carbohydrates. According to the Institute of Medicine (2005), 45 – 65% of total calories should come from carbohydrates. Total fat and saturated fat intake were all quite close to the recommended intakes. Consuming enough fat may be easier because of food choices available readily to college students at fast food restaurants or even on campus that are high in fat. Overall, subjects in this study were close to the recommended intakes of most of the energy nutrients analyzed indicating a well balanced diet in regard to macronutrient composition.

The amount of exercise varied greatly. The mean number of self-reported days exercised based on the three day exercise form was 1.7 ± 1.096 days, indicating that more people exercised almost two of the past three days. Of subjects studied, 41.86% exercised less than 60 minutes in the past three days indicating that a large number of subjects were not exercising regularly. Of subjects studied, 45.35% did not meet the national recommendations of either 150 minutes of activity at moderate level of intensity, or 75 minutes of exercise at a vigorous intensity level.

According to the U.S. Department of Health and Human Services (2008), many positive health benefits including less likely to develop chronic diseases, are achieved when exercising at least 150 minutes at a moderate intensity or 75 minutes at a vigorous intensity per week. Subjects in this study need more exercise in order to achieve the benefits associated with regular exercise. The level of intensity of exercised varied as well with the highest mean number of minutes exercised at a moderate intensity compared to easy or hard intensity. More people exercised at a moderate intensity level than easy or hard.

The average BMI of female college students participating was 23.3. This indicated that the majority of subjects had a normal weight for height. Few subjects were either underweight or obese. One study of college students found 27% of subjects were overweight and 8% were considered obese (Brunt, Rhee, & Zhong, 2008). In the current study about 21% were overweight and 5% were obese. One possible reason for the lower numbers in the underweight and obese categories is a lower frequency of underweight or obese individuals on the campus in the present study. Another reason may be that those individuals in these weight categories did not choose to participate in the study. Tricep skinfolds were used as a secondary measure of body fat. More subjects fell into the $16^{th} - 25^{th}$ percentile, followed by the $51^{st} - 75^{th}$ percentile. This indicates that subjects tended to have either a lower tricep skinfold than 75 out of 100 other females the same age, or have a lower tricep skinfold than 25 out of 100 females the same age. Subjects tended to have a healthy normal tricep skinfold measurement.

Multiple significant differences between group means were found for BMI and the MBSRQ subscales when calculating by a t-test. Normal weight individuals tended to have higher health evaluation and fitness orientation scores meaning they were more likely to feel attractive, be satisfied with appearance, and be actively involved in physical activities compared to subjects

who were overweight. Subjects with a higher BMI placed in the overweight group also had lower mean scores for both health evaluation and health orientation subscales. This indicated they felt slightly unhealthier and were more indifferent about their health. The overweight group had a lower body areas satisfaction score meaning subjects were more likely to be unhappy about the size or appearance of their bodies. Another study had similar findings and reported college students' body satisfaction was lower as the BMI increased (Jonnalagadda, Ziegler, & Nelson, 2004). Ziegler (2005) also noted a higher BMI was associated with an increase in dissatisfaction. The normal weight group had a lower mean score for both the overweight preoccupation and self-classified weight subscales, indicating less anxiety surrounding weight, less dieting behaviors, and a normal perceived weight. The overweight group, as expected, perceived their weight as closer to overweight. No statistical significant differences were found when performing an ANOVA between age and MBSRQ subscales, age and dietary intake, and age and exercise levels. The age range of subjects was narrow from 18 – 25. It was also found that those with a carbohydrate intake below or near the recommended value would have a higher appearance evaluation score indicating more satisfaction with appearance and feelings of attractiveness.

Numerous correlations were found between dietary intake variables and the MBSRQ subscales (Tables 2 – 8). Appearance orientation and protein intake were found to be negatively correlated ($r = -.251$, $p \leq 0.05$). This relationship indicated those with a lower intake of protein will be more likely to be invested in appearance, placing importance on how one looks. Most protein consumed tends to be found in animal products that also are higher in fat (Institute of Medicine, 2005). Those placing importance on outward appearance may thus consume less protein. Fitness orientation and total fat intake were also found to be significantly correlated in

an inverse relationship ($r = -.221$, $p \leq 0.05$). Those that tend to exercise regularly have a lower intake of total fat. Fat has the most calories per gram out of all the macronutrients. Many women exercise to maintain or lose weight, thus an intake lower in fat would be expected (Brown, Cash, & Mikulka, 1990).

As total fat intake declines, subjects had a tendency to be more physically active and invested in their physical fitness. Health evaluation was inversely related to numerous dietary variables including total sugar, total fat, and saturated fat intake. As each of these dietary variables increased, lower health evaluation scores were likely, meaning subjects would feel unhealthy and more vulnerable to illnesses. Calories, total fat, and saturated fat intake were all inversely correlated with health orientation. Lower caloric, total fat and saturated fat intake were associated with higher health orientation scores. This indicated that subjects who were health conscious and attempted to live a healthy lifestyle were more likely to consume less calories, total fat, and saturated fat. Saturated fat has been found to increase LDL levels which in turn can increase the risk for heart related diseases (American Heart Association, 2009). Those concerned with the health of their body might be more likely to consume less amounts of saturated and total fat. A high score on the body area satisfaction scale, meaning those that are generally happy with most areas of the body, predicted a lower intake of calories and carbohydrates. Carbohydrates contribute more calories to the diet than any other macronutrient (Institute of Medicine, 2005). Therefore, subjects that are dissatisfied with individual and overall body parts (low score) may consume more carbohydrates and calories. Finally, no correlation between any dietary variables and the self-classified weight subscale was found. In other words, dietary intake is not related to ones perception of weight status ranging from under weight to overweight.

Correlations were determined between body fat percentage and BMI and the MBSRQ subscales (Table 9). As body fat percentage and BMI decreased, appearance evaluation scores had a tendency to increase, in other words, more positive feelings about appearance were related to lower body fat percentage and a lower BMI. This is in accordance with a study that found those with a higher BMI exhibited more dissatisfaction (Ziegler et al., 2005). Individuals with either Bulimia Nervosa or eating disorder NOS tend to have a healthy BMI of 20-24.9 kg/m^2 (Fairburn, 2008). Individuals with a higher BMI tend to exhibit more dissatisfaction which could lead to the development of eating disorders. Fitness evaluation as well was negatively correlated with body fat percentage ($r = -.293$, $p \leq 0.01$). Those actively involved in physical activity tended to exhibit a lower body fat percentage. This finding was to be expected. As a person exercises, calories and fat are burned, decreasing the overall body fat percentage. Subjects feeling as though they are in good health had a tendency to have a lower body fat percentage ($r = -.279$, $p \leq 0.05$). Large amounts of fat contribute to several diseases including cardiovascular disease, diabetes, and some cancers. A person with lower body fat would most likely feel less at risk for diet related diseases, hence in better health.

An overall feeling of content with most areas of the body was found to be associated with a lower body fat percentage. Positive correlations were observed for both overweight preoccupation and self-classified weight at the $p \leq 0.01$ level. In other words, feelings of anxiety surrounding weight, dieting status, weight awareness, or a perceived weight status as overweight is associated with a higher body fat percentage. Gruber et al. (2001) also found higher body fat percentages among those that dieted. With higher obesity rates and higher levels of body fat percentage, it would be expected that an increase in dieting, weight awareness and perceiving weight status as more overweight would also occur. A higher BMI was positively associated

with higher scores on overweight preoccupation and self-classified weight at the $p \leq 0.01$ level. Similar findings have been noted. Increased levels of dieting were associated with a higher dissatisfaction and BMI according to Ziegler et al. Of the dietary variables, body fat percentage was only found to be related to protein intake ($r = -.299$, $p \leq 0.01$). A lower intake of protein was correlated with a higher body fat percentage.

Certain subscales of the MBSRQ were found to be associated with other subscales in the questionnaire (Appendix H). Appearance evaluation was found to be associated with all other subscales except for appearance orientation. This is a little surprising because both subscales focus on appearance. The lack of significance shows people may have feelings of attractiveness or unattractiveness, but may not be invested in appearance. Appearance evaluation was strongly correlated positively with body areas satisfaction scale ($r = .815$, $p \leq 0.01$) indicating a relationship between satisfaction with appearance and general contentment with most areas of the body. These two scales measure similar constructs, therefore it would be expected that a positive correlation would exist. Appearance evaluation was found to be positively correlated with fitness orientation ($r = .388$, $p \leq 0.01$). This indicates those that are more satisfied with their appearance exercise more; however, excessive amounts of exercise have been found to be a characteristic of eating disorders and thus related to body dissatisfaction (Fairburn, 2008). Appearance orientation was found only to be correlated positively with overweight preoccupation, indicating a high investment in appearance would be related to feelings or behaviors of anxiety, dieting, or awareness of weight. Results are similar to other studies including one that found those that had a higher perceived weight having more dissatisfaction with their physical appearance (Cash & Hicks, 1990). Another study found those that dieted were more dissatisfied with their bodies (Gruber et al., 2001). Distorted perceptions about the

subjects' fatness in the study by Gruber et al. contributed to the dissatisfaction. Dieting as well as a preoccupation about weight are characteristics of eating disorders (Fairburn, 2008). Those that tended to be more preoccupied with weight also were more dissatisfied with appearance, a common finding of those with eating disorders. One study of college females dieting found that 3.5% developed an eating disorder at the two year follow up (Fairburn et al., 2005). Dietary restraint and dietary restriction were thought to contribute to the development of eating disorders.

Fitness evaluation and fitness orientation were also strongly correlated ($r = .715$, $p \leq 0.01$). This would also be expected because if a feeling of being in shape or athletically competent exists, most likely an investment in being physically fit has occurred. Self-classified weight was found to be negatively correlated with both fitness evaluation and health evaluation ($r = -.300$ and $r = -.236$, respectively). This is in accordance with other research. It was found that people that value specific domains are more likely to engage in the maintenance or enhancement of activities related to those domains (Brown, Cash, & Mikulka, 1990). For example those that believe themselves to be physically fit will exercise regularly to maintain their fitness. Cash and Hicks (1990) found self-proclaimed overweight status was associated with dissatisfaction with physical fitness and health. This may signify individuals with a perceived overweight status have feelings of less physical fitness and less overall health.

Some MBSRQ subscales were related to levels of exercise (Appendix I). Lowery et al. (2005) found women who exercised exhibited similar or even greater degrees of dissatisfaction compared to those who did not exercise. Women tended to exercise to feel more attractive. This association would have been reflected in a relationship between exercise and appearance evaluation; however, the current study found no relationship between exercising and appearance evaluation. Self-classified weight was not associated with the number of days exercised,

indicating that those feeling overweight or underweight do not have a tendency to exercise any specific amount of time. Fitness evaluation and fitness orientation were both found to be positively related to the number of days exercised, minutes of hard intensity exercised, and the estimated minutes of any intensity level of exercise per week. This correlation was to be expected. Feeling of physical fitness or active involvement in physical activities would result in more exercise during the week. Health evaluation and orientation were also found to be positively related to the number of days exercised. According to the Institute of Medicine (2005), regular exercise is associated with improved mental health, lower risk of type 2 diabetes, and heart disease. This is in accordance with the findings of this study of increased physical activity for those that are health conscious and invested in their health.

The final correlations computed were between the dietary intake variables and the amount of exercise (Appendix J). Only total fat and saturated fat intake were found to be related to exercise. Both of these variables were negatively correlated with the total minutes of moderate intensity exercise of subjects (Figure 15). As fat intake decreased the number of minutes of moderate intensity exercise had a tendency to increase. Many women exercise to maintain or lose weight (McDonald, & Thompson, 1992). It would be expected that those trying to maintain or lose weight would consume less of the most caloric dense nutrient. When exercising regularly and especially at high intensity levels, an increase of caloric intake is expected (Institute of Medicine, 2005). This study did not find any significant correlation between caloric intake and exercise.

Conclusions

Results of this study showed that there was a correlation between body image and macronutrient intake among female college students. Protein intake was negatively correlated

with appearance orientation and total fat was negatively correlated with fitness orientation. Total fat and saturated fat intake were all negatively associated with health evaluation. Calories, total fat, and saturated fat intake were negatively correlated with health orientation. Calories and carbohydrate intake were negatively correlated with body areas satisfaction scale.

Several statistically significant correlations existed between body image assessment and physical activity levels among female college students. Fitness evaluation and orientation were related to the number of days exercised and varying intensities. Health evaluation and orientation were also found to be positively correlated with the number of days exercised.

Statistically significant correlations were found between body image and body fat percentage among female college students. A negative association between appearance evaluation, fitness orientation, health orientation, and body areas satisfaction scale and body fat percentages was noted, while a positive correlation with overweight preoccupation and self-classified weight was noted. Body fat percentage was also found to be significantly related to protein intake negatively.

Numerous statistically significant correlations between the different subscales of the MBSRQ were found. Correlations existed between the different dietary variables measured, including but not limited to relationships between all variables and calories, and types of fat and the total fat intake. A large number of subjects in this study were found to not be meeting the national recommendations for exercising at least 150 minutes at moderate intensity or 75 minutes at vigorous intensity.

Statistically significant differences were found between group means of BMI and body image among female college students. Normal weight individuals based on BMI had a higher appearance evaluation, fitness orientation, health evaluation, health orientation, and body areas

satisfaction score compared to those that were overweight. A lower score on the overweight preoccupation and self-classified weight subscales were found in the normal weight group.

Limitations

A number of limitations existed for this study. Subjects chosen to participate were not randomized. The courses in which subjects were chosen were also not picked at random, therefore the data gathered in this study may not be generalizable to the whole population of undergraduate female students at the University of Wisconsin–Stout. Another limitation resulted from the 24 hour dietary recall. Results from the subjects recording the food intake over the past 24 hours may not be accurate for a number of reasons, including under or over estimation of amount of foods, not remembering all the foods eaten, and not enough information about the food for the researcher to correctly match the food item in the diet analysis software. Body fat percentage values may not be completely accurate. Measurements were taken using the Tanita Bioelectrical Impedance machine. If a subject was dehydrated, body fat percentage would be higher. Skinfold measurements were taken as a second means of determining body fat percentage. Calculations from skinfold measurements did not match with the value from the bioelectrical impedance for all subjects. An error in taking the skinfold measurement could have occurred. The bioelectrical impedance machine results were used to provide the body fat percentage for data analysis in this study.

Recommendations

After reviewing the methodology and results of this study, several recommendations for future research are suggested. Although the sample size was adequate, a larger sample size may have led to different results. When performing the chi-square test between diet and the MBSRQ subscales, most groups did not have enough subjects in each category to make the chi-square

analysis valid. It would have been more ideal to have the diet intake split into the three categories of less than 90% of the recommendation met, 90% - 110%, and above 110% in order to see what relationships existed based on intake of a nutrient rather than the two categories used of < 110% and greater than 110%.

The second recommendation would be to randomly select subjects. For this study classes were chosen for recruitment and those interested signed up. Subjects may have chosen to sign up if they were more interested in learning about their body fat percentage scores. Typically those that are athletic seem more interested in body fat percentage than the average person. Also, underweight, overweight or obese individuals may not have felt comfortable participating resulting in a higher percentage of normal weight subjects. Randomly choosing subjects would provide a better means of attaining subjects.

The third recommendation would be a more accurate means of determining a subject's diet. A 24-hour recall was used in the current study; however, some subjects had a difficult time remembering everything they ate and estimating portion sizes. It would be suggested that subjects be given a food log, asked to record what is eaten, and bring in the log on the day the measurements and survey are given. Subjects could also be asked to accurately measure serving sizes. These modifications could result in more accurate measurement of dietary intake variables.

The fourth recommendation would be to determine hydration status on the day that the body fat percentage is taken using the Tanita bioelectrical impedance machine. Over hydration can result in a lower than normal body fat percentage, while dehydration can inflate the number. Asking the subjects to drink a specific amount of water depending on what time the measurement is taken may improve hydration status.

Of interest for future research would be to determine if any correlation exists between vitamin and mineral intake and body satisfaction. Additionally, research could be done in the area of food group intake and body satisfaction to determine if for example body satisfaction is related to the serving of whole grains, fruit and vegetables, dairy, etc. Studying different types of physical activity or athletics and body satisfaction is also a possibility. This study could also be replicated on a wider age range to determine if similar correlations exist for younger and older subjects and with other ethnicities. In general, more research should be conducted to validate these findings and determine if they are similar in other settings.

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Appendix A

STOUT
UNIVERSITY OF WISCONSIN

Research Services
152 Voc Rehab Building

University of Wisconsin-Stout
P.O. Box 790
Menomonie, WI 54751-0790

715/232-1126
715/232-1749 (fax)
http://www.uwstout.edu/rs/

Date: May 27, 2009

To: Laurelyn Harper

Cc: Dr. Carol Seaborn

From: Sue Foxwell, Research Administrator and Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB) Susan Foxwell

Subject: **Protection of Human Subjects in Research**

Your project, "*The Impact of Macronutrient Intake on Body Image among Female College Undergraduate Students*" is **Exempt** from review by the Institutional Review Board for the Protection of Human Subjects. The project is exempt under **Category 2** of the Federal Exempt Guidelines and holds for 5 years. Your project is approved from **December 9, 2008**, through **December 8, 2013**.

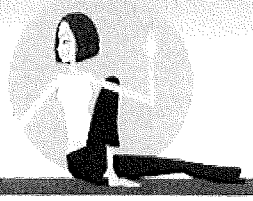
Please copy and paste the following message to the top of your survey form before dissemination:

> **This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46**

Please contact the IRB if the plan of your research changes. Thank you for your cooperation with the IRB and best wishes with your project.

***NOTE: This is the only notice you will receive – no paper copy will be sent.**

Appendix B



Do you know your Body Fat percentage?

Participate in a Graduate Research Study that will calculate your body fat percentage.

All you need to do is:

- Fill out a short survey.
- Have a professional measure your height, weight and body fat.
- Attire: Your most comfortable T-shirt and shorts.

- Commit 25-35 minutes between February 2 and February 13.
- You must be a female undergraduate student at UW-Stout to qualify.

Contact Laurelyn Harper **at** harperl@uwstout.edu **for more information or to sign up.**

Laurelyn Harper harperl@uwstout.edu

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Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu
Laurelyn Harper harperl@uwstout.edu

Appendix C

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

Consent to Participate In UW-Stout Approved Research

Title: The Impact of Macronutrient Intake on Body Image among Female College Undergraduate Students

Investigator:
Laurelyn Harper
HMEC 434
715-314-0391
harperl@uwstout.edu

Research Sponsor:
Dr. Carol Seaborn
HMEC 219
715-232-2216
seabornc@uwstout.edu

Description:

As a participant in this study, you will be asked to do a number of things. The first is allowing the researcher to collect body measurement data including height, weight, and percent body fat using a body composition analyzer, stadiometer, and skinfold calipers. In order to have these measurements taken, you, the participant, will need to wear shorts and a T-shirt or equivalent clothes and remove both your socks and shoes. After the researcher completes the measurements needs, subject may change back into normal street clothes. In the next part of the study, you will be asked to fill out a 69 item survey. Finally, you will be asked to recall what you have consumed, both food and beverage, in the last 24 hours and provide a description of the exercise you have done in the last week.

Risks and Benefits:

There is a possibility that some of the questions in the survey may make you feel uncomfortable. We will be asking you about personal things and you may feel embarrassed at times when answering questions about your body image, eating patterns, and body weight. If you do feel uncomfortable, you can choose not to answer certain questions, you can take a break and continue later, or you can choose to stop participating in the study. If a problem arises and you wish, you can contact the Counseling Center at 410 Bowman Hall, (715) 232-2468, or Student Health Center (715) 232-2114.

This study was not designed to benefit you directly; you will learn your percent body fat through your participation. In addition, what is learned from the study may help the profession to better understand food consumption patterns as they relate to body image.

Time Commitment and Payment:

Subjects can be expected to dedicate between 25 and 35 minutes one time only to complete a survey, 24 hour dietary recall, and have height, weight, and body fat measurements taken. No payment will be given for participation in this study.

Confidentiality:

Any and all information obtained from you during the study will be confidential. Your privacy will be protected at all times. Your name will not be included on any documents. We do not believe that you can be identified from any of this information. The signup sheet containing students' names and email addresses will be shredded upon data collection.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate or withdraw at any time without any adverse consequences to you. However, should you choose to participate there is no way to identify your anonymous document after it has been turned into the investigator. You may also refuse to answer any questions.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: Laurelyn Harper
715-314-0391
harperl@uwstout.edu

Advisor: Dr. Carol Seaborn
715-232-2216
SeabornC@uwsout.edu

IRB Administrator
Sue Foxwell, Director, Research Services
152 Vocational Rehabilitation Bldg
UW-Stout
Menomonie, WI 54751
715-232-2477
foxwells@uwstout.edu

Statement of Consent:

By completing the following survey, 24 hour dietary recall, and allowing the researcher to collect the anthropometric measurements of height, weight, and body fat, you agree to participate in the project entitled, "The Impact of Macronutrient Intake on Body Image among Female College Undergraduate Students."

Appendix D

Demographics

Age: _____

Year in School: _____Freshman _____Sophomore _____Junior _____Senior _____Other

Residence during School year: _____ (Dorms, at home, off campus, etc.)

Race: ___Caucasian ___African American ___Hispanic ___Native American ___Asian or Pacific Islander

Anthropometric Measurements

Height	Inches	Inches	Cm	Cm

Weight	Pounds	Pounds	Kg	Kg
BMI				
Body Fat Percentage				

Skinfolds	1	2	3
Triceps			
Iliac Crest			
Thigh			

Appendix E

THE MBSRQ

INSTRUCTIONS--PLEASE READ CAREFULLY

The following pages contain a series of statements about how people might think, feel, or behave. You are asked to indicate the extent to which each statement pertains to you personally.

Your answers to the items in the questionnaire are anonymous, so please do not write your name on any of the materials. In order to complete the questionnaire, read each statement carefully and decide how much it pertains to you personally. Using a scale like the one below, indicate your answer by entering it to the left of the number of the statement.

EXAMPLE:

_____ I am usually in a good mood.

In the blank space, enter a **1** if you **definitely disagree** with the statement;
enter a **2** if you **mostly disagree**;
enter a **3** if you **neither agree nor disagree**;
enter a **4** if you **mostly agree**;
or enter a **5** if you **definitely agree** with the statement.

There are no right or wrong answers. Just give the answer that is most accurate for you. Remember, your responses are confidential, so please be completely honest and answer all items.

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

_____ 1. Before going out in public, I always notice how I look.

_____ 2. I am careful to buy clothes that will make me look my best.

_____ 3. I would pass most physical-fitness tests.

_____ 4. It is important that I have superior physical strength.

_____ 5. My body is sexually appealing.

_____ 6. I am not involved in a regular exercise program.

_____ 7. I am in control of my health.

_____ 8. I know a lot about things that affect my physical health.

_____ 9. I have deliberately developed a healthy lifestyle.

_____ 10. I constantly worry about being or becoming fat.

_____ 11. I like my looks just the way they are.

_____ 12. I check my appearance in a mirror whenever I can.

_____ 13. Before going out, I usually spend a lot of time getting ready.

_____ 14. My physical endurance is good.

_____ 15. Participating in sports is unimportant to me.

_____ 16. I do not actively do things to keep physically fit.

_____ 17. My health is a matter of unexpected ups and downs.

_____ 18. Good health is one of the most important things in my life.

_____ 19. I don't do anything that I know might threaten my health.

continued on the next page

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

_____ 20. I am very conscious of even small changes in my weight.

_____ 21. Most people would consider me good-looking.

_____ 22. It is important that I always look good.

_____ 23. I use very few grooming products.

_____ 24. I easily learn physical skills.

_____ 25. Being physically fit is not a strong priority in my life.

_____ 26. I do things to increase my physical strength.

_____ 27. I am seldom physically ill.

_____ 28. I take my health for granted.

_____ 29. I often read books and magazines that pertain to health.

_____ 30. I like the way I look without my clothes on.

_____ 31. I am self-conscious if my grooming isn't right.

_____ 32. I usually wear whatever is handy without caring how it looks.

_____ 33. I do poorly in physical sports or games.

_____ 34. I seldom think about my athletic skills.

_____ 35. I work to improve my physical stamina.

_____ 36. From day to day, I never know how my body will feel.

_____ 37. If I am sick, I don't pay much attention to my symptoms.

_____ 38. I make no special effort to eat a balanced and nutritious diet.

continued on the next page

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

_____ 39. I like the way my clothes fit me.

_____ 40. I don't care what people think about my appearance.

_____ 41. I take special care with my hair grooming.

_____ 42. I dislike my physique.

_____ 43. I don't care to improve my abilities in physical activities.

_____ 44. I try to be physically active.

_____ 45. I often feel vulnerable to sickness.

_____ 46. I pay close attention to my body for any signs of illness.

_____ 47. If I'm coming down with a cold or flu, I just ignore it and go on as usual.

_____ 48. I am physically unattractive.

_____ 49. I never think about my appearance.

_____ 50. I am always trying to improve my physical appearance.

_____ 51. I am very well coordinated.

_____ 52. I know a lot about physical fitness.

_____ 53. I play a sport regularly throughout the year.

_____ 54. I am a physically healthy person.

_____ 55. I am very aware of small changes in my physical health.

_____ 56. At the first sign of illness, I seek medical advice.

_____ 57. I am on a weight-loss diet.

continued on the next page

For the remainder of the items use the response scale given with the item, and enter your answer in the space beside the item.

_____ 58. I have tried to lose weight by fasting or going on crash diets.

1. Never
2. Rarely
3. Sometimes
4. Often
5. Very Often

_____ 59. I think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight
5. Very Overweight

_____ 60. From looking at me, most other people would think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight
5. Very Overweight

continued on the next page

61-69. Use this 1 to 5 scale to indicate how dissatisfied or satisfied you are with each of the following areas or aspects of your body:

1	2	3	4	5
Very Dissatisfied	**Mostly Dissatisfied**	**Neither Satisfied Nor Dissatisfied**	**Mostly Satisfied**	**Very Satisfied**

_____ 61. Face (facial features, complexion)

_____ 62. Hair (color, thickness, texture)

_____ 63. Lower torso (buttocks, hips, thighs, legs)

_____ 64. Mid torso (waist, stomach)

_____ 65. Upper torso (chest or breasts, shoulders, arms)

_____ 66. Muscle tone

_____ 67. Weight

_____ 68. Height

_____ 69. Overall appearance

Appendix F

24 Hour Recall

Use the table below to record all foods eaten in a 24 hour period. Please note the time, a description of the food item, including beverages, preparation method, where the food was consumed, and the amount consumed. Please also include alcohol consumption. You can use the food models and other items available to help estimate portion sizes. *Please note that information from your food record including alcohol consumption will remain confidential. No names or identification information will be associated with your record.*

Please be as specific as possible. Include all beverages and alcohol, condiments, portion sizes, and brand of food.

Portion Size:				
C = cup	Tbsp = tablespoon	M = medium	exl = Ex-Large	sl = slice
Tsp = teaspoon	S = small	L = large	Oz = ounce	ea = each

Is this a typical day for you? Yes______ No______

Which day of the week did you record?

Monday___ Tuesday ___ Wednesday ___ Thursday ___ Friday ___ Saturday___ Sunday ___

Time	Description of food or beverage, including Alcohol	Preparation Method	Where	Amount consumed
Examples 11:30 AM	Peanut butter (reduced fat) and jelly (Smucker's strawberry) sandwich on white bread	Toasted bread	Dorm room	2 sl 2 tbs ea
8:00 PM	Big Mac with white bun, ketchup, mustard, pickles	Fast food	McDonald's	¼ lb

Appendix G

Description of Exercise

Please list all the exercise you have done in the past 3 days. Be sure to include type of exercise, how long you exercised, the distance if it pertains, and the intensity of exercise. Please circle the intensity level as either easy, medium, or hard. Try to be as accurate as possible. Information will remain confidential.

Date	Type of Exercise	Time (Minutes)	Exercise Intensity
Example Jan. 1	Running on a treadmill	60 min	Easy Medium (Hard)
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard
			Easy Medium Hard

Appendix H

Correlations between MBSRQ Subscales

Subscale	Appearance Evaluation	Appearance Orientation	Fitness Evaluation	Fitness Orientation	Health Evaluation	Health Orientation	Body Areas Satisfaction	Overweight Preoccupation	Self-Classified Weight
				n = 84					n = 83
Appearance Evaluation	—	-.078	.324**	.388**	.373**	.523**	.815**	-.621**	-.673**
Appearance Orientation		—	.065	.143	.134	-.007	-.068	.343**	.066
Fitness Evaluation			—	.715**	.405**	.404**	.382**	-.125	-.300**
Fitness Orientation				—	.384**	.629**	.416**	-.035	-.396**
Health Evaluation					—	.481**	.462**	-.224*	-.230*
Health Orientation						—	.532**	-.052	-.288**
Body Areas Satisfaction							—	-.584**	-.522[a]**
Overweight Preoccupation								—	.556**
Self-Classified Weight									—

[a]n = 84.

*p ≤ 0.05, 2-tailed. **p ≤ 0.01, 2-tailed.

Appendix I

Correlations between MBSRQ Subscales and Exercise

Subscale	Number of Days Exercised	Minutes Easy Intensity	Minutes Moderate Intensity	Minutes Hard Intensity	Estimated Minutes Easy/Moderate Per Week	Estimated Minutes Hard Per Week
Appearance Evaluation	.002	.136	.040	.060	.130	.060
Appearance Orientation	.064	-.076	-.065	.044	-.094	.044
Fitness Evaluation	.329**	.178	.141	.238*	.215*	.238*
Fitness Orientation	.354**	.205	.178	.266*	.255*	.266*
Health Evaluation	.320**	.195	.067	.208	.191	.208
Health Orientation	.219*	.149	.193	.123	.218*	.123
Body Areas Satisfaction Scale	.127	.137	.068	.126	.145	.123
Overweight Preoccupation	.109[a]	-.121[a]	.177[a]	-.018[a]	-.008[a]	-.018[a]
Self-Classified Weight	-.055	-.157	.013	.123	-.120	.119

Note. n = 84 unless otherwise noted. [a]n = 83.

*p ≤ 0.05, 2-tailed. **p ≤ 0.01, 2-tailed.

Appendix J

Correlations between Dietary Intake and Exercise

Macronutrient	Number of Days Exercised	Minutes Easy Intensity	Minutes Moderate Intensity	Minutes Hard Intensity	Estimated Minutes Easy/Moderate Per Week	Estimated Minutes Hard Per Week
Calories	-.144	-.041	-.198	.097	-.137	.097
Protein	-.111	-.007	-.091	.106	-.054	.106
Carbohydrate	-.085	-.041	-.124	.074	-.098	.074
Total Fat	-.150	-.015	-.225*	.056	-.131	.056
Saturated Fat	-.107	.001	-.214*	.047	-.112	.047

*$p \leq 0.05$, 2-tailed.