ABSTRACT

HEUSCH, Lisa. The relationship between body image and body composition, physical condition, and weight concerns of female college freshmen. M.S. in Adult Fitness/Cardiac Rehabilitation, 1988. 66 p. (Dr. Philip K. Wilson)

Thirty-three female college freshmen were studied to compare the perceptions of body image to direct measurement of select variables which influence body image. Subjects were required to complete the Body Esteem Scale (Franzoi & Shields, 1984), perform a VO_2 Max test, and have underwater weight measured. Comparison was then made between self-perceptions and measured values. In regards to body weight, subjects were found to possess a better body image as weight decreased. In addition, body satisfaction increased in those who classified themselves into lower weight categories. No significance was found between subject weight perception and percent body fat, indicating an inaccurate assessment of body weight. A high correlation was found between the subjects' perceptions of ideal body weight and the measured desired body weight Such that as calculated desired body weight increased, perceived ideal body weight decreased. In regards to physical condition, no significance was found between body image and level of physical condition. It was therefore concluded that subjects were more satisfied as percent body fat and self-perception of weight decreased, but the subjects held distorted perceptions with regards to self-perception of weight, with those of heavier weights being more distorted in their perception of ideal body weight. It was also concluded that the subjects were not correct in their perception of physical condition.

The Relationship between Body Image and Body Composition, Physical Condition and Weight Concerns of Female College Freshmen

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by

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We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

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This thesis is approved for the College of Health, Physical Education and Recreation.

Dean, College of Health, Physical Education and Recreation	May 23, 1988 Date
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DEDICATION

Sincere thanks is extended to my committee members; your guidance was very much needed and greatly appreciated!

To the undergraduates: Thanks for your help in the lab; your all a great bunch!

To my parents: You've been there for me through it all. Thank you for all the love, support, and encouragement you've given; I love you!

To Andrew David: Thanks buddy!

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Recently, there has been an abundance of attention given to the prevalence of eating disorders present among today's youth. Two of the major causes for concern are anorexia nervosa and bulimia. Herzog and Copeland (1985) described these two conditions as follows:

> Anorexia nervosa is a syndrome characterized by extreme weight loss, body image disturbance, and an intense fear of becoming obese. Bulimia is a syndrome distinct from anorexia nervosa and is characterized by secretive binge eating episodes followed by self-induced vomiting, fasting or the use of laxatives or diuretics (p. 295).

It has been reported that approximately 5 to 10 percent of adolescent females fall victim to anorexia and bulimia, while an even greater percentage display characteristics of the disease to a less severe extent (Pope, Hudson, Yurgelun, & Todd, 1984). Herzog and Copeland (1985) reported a slightly higher estimate of 10 to 15 percent of adolescent females being affected by eating disorders. It is believed that anorexia nervosa and bulimia typically occur during adolescence with 90 to 95 percent of those afflicted being female (Herzog & Copeland, 1985). It has been suggested that females place more importance on appearance than do males, thus explaining the reason why more women than men become involved with pathogenic weight control behaviors (Hays & Ross, 1987).

The underlying reason for the development of such pathogenic weight control methods has yet to be determined, however, a review of the

literature indicates a misperception of body image may contribute to the development of pathogenic weight control behaviors. Body image has been defined as the manner in which an individual perceives and conceives of his/her own body (Van der Velde, 1985). The image one has of his/her body is important in that it reflects how one feels about themselves. Van der Velde (1985) believed that a person's body image forms the basis of the self-concept. Thus, possession of a positive body-image results in a positive self-image while a negative body image results in a negative self-image.

The period of adolescence is of major importance in the development of body image (Van der Velde, 1985). During this time, there is an increased consciousness of socially acceptable conditions of appearance and behaviors (Comer, 1984). Because of the importance of a positive body image, an adolescent who perceives herself to be overweight may resort to abnormal methods to obtain and/or secure weight loss (Herzog & Copeland, 1985). A study conducted by Marrale, Shipman, and Rhodes (1986) indicated that 38 percent of female adolescents surveyed considered themselves to be overweight. In addition, 65 percent of those surveyed reported the primary motivation for dieting to be that of appearance enhancement. This is in agreement with Thompson (1986) who found that over 95 percent of the 100 females surveyed, overestimated their body size.

Since a large number of adolescent females possess distorted body images, further investigation is needed to determine whether or not these perceptions are justified.

Statement of the Problem

This study was conducted to compare perceived body image variables to body composition, physical condition, and weight concerns of female college freshmen as interpreted through a descriptive analysis of body image and determination of percent body fat, maximal aerobic power, and desired weight.

Need for the Study

It is generally agreed that acceptable levels of body fat for females range from 19 to 25 percent (Stamford, 1987), with 12 percent being the minimum acceptable level (Katch, Katch, & Behnke, 1980). Approximately 30 percent body fat is generally described as an indication of obesity (Michael, Burke, & Avakian, 1979).

Females who possess an acceptable level of percent body fat, yet perceive themselves to be overweight because of a distorted body image, may risk the possible development of an eating disorder (Killen et al., 1986). Such misperceptions could manifest into the use of pathogenic weight control methods, resulting in very harmful effects. Some of the complications attributed to anorexia nervosa include: amenorrhea, osteoporosis, bradycardia, hypotension, constipation, and anemia (Herzog & Copeland, 1985). Bulimics often times suffer menstrual irregularities, ipecac poisoning, dental-enamel erosion, and esophagitis (Herzog & Copeland, 1985).

By determining the relationship between perceived body image and

actual body composition, physical condition, and weight concerns, the prevalence of body image distortion can be identified. Further research in the existence of distorted body image is needed.

Hypothesis

The following null hypothesis were formulated:

1) There is no significant relationship between body image variables (sexual attractiveness, weight concerns and physical condition) and percent body fat of female college freshmen as determined by underwater weighing.

2) There is no significant relationship between body image variables and physical condition of female college freshmen as measured by VO_2 uptake.

3) There is no significant relationship between body image variables and self-perception of body weight in female college freshmen.

4) There is no significant relationship between self-perceptions of body weight and true percent body fat in female college freshmen.

5) There is no linear relationship between self-perceived ideal body weight and desired body weight as calculated by Jackson & Pollock's Desired Body Weight formula.

Delimitations

The following were delimitations of the study:

1) The subjects included female college freshmen between the ages of 18 - 20 years.

2) Physical condition was measured by a Max VO_2 treadmill test.

3) All participants in the study were from the University of Wisconsin - La Crosse, La Crosse, WI.

Limitations

The following were limitations of the study:

1) Subject refusal to participate was beyond the control of the investigator.

2) Participation of undiagnosed anorexics or bulimics was beyond the control of the investigator.

3) Misinterpretation of questions may have altered the outcome.

4) Access to lab equipment limited the investigation to the La Crosse area college students.

5) Subject participation was ultimately limited to self-selection.

Assumptions

The following assumptions were made:

1) The individuals studied were representative of the average female college freshman.

2) The respondents reported their attitudes and behaviors truthfully.

3) Pre-testing guidelines were followed by the subject.

4) Testing procedures were performed to the subject's best ability.

5) All subjects were in good health at the time of testing.

6) The test administrator was consistent in the testing procedures.

7) All equipment utilized in the study was properly functioning after it was calibrated.

Definition of Terms

The following are definitions of terms related to the present study.

Acceptable body fat level: 19 to 25 percent body fat.

Adolescence: period of time between puberty and maturation, generally considered between 12 and 21 years of age.

Anorexia nervosa: eating disorder characterized by extreme weight loss, body image disturbance and an intense fear of becoming obese.

Beckman Metabolic Measurement Cart: A self-contained unit which includes an OM-11 oxygen analyzer, an LB-2 carbon dioxide analyzer, a flow meter, and programmable computer.

Body composition: division of the body into two principle tissue components: fat and lean.

Body esteem: the degree of satisfaction one feels with his/her body.

Body image: manner in which an individual perceives and conceives of his/her own body.

Bulimia; eating disorder characterized by secretive binge and eating followed by self-induced vomiting, fasting, or the use of laxatives or diuretics.

Hydrostatic weighing: procedure using underwater weight to determine the volume of the body.

Maximal aerobic power: maximal amount of oxygen that can be consumed, transported, and utilized per minute during maximal exercise.

Pathogenic weight control: health-threatening method used to control weight such as vomiting, abuse of laxatives, or misuse of diuretics.

Percent body fat: percentage of total body weight that consists of adipose tissue.

Physical condition: level of cardiorespiratory fitness as measured by a test of maximal aerobic power.

Residual volume: air remaining in the lungs after a maximal expiration.

Weight concerns: self-perception of weight and self-perceived ideal body weight.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

Discussed within this chapter are: (1) the characteristics associated with the period of adolescence, (2) body image of adolescent females, (3) the physical characteristics to be measured, (4) the relationship of body image to eating disorders, and (5) methods of measurement.

Adolescence

The stage of adolescence is generally thought to encompass ages 12 through 21 years (Marrale et al., 1986). It is a time marked by increased social development and rapid physical growth (Marrale et al., 1986). Adolescence is a period characterized by the need to gain independence from parental bonds and develop acceptance outside of the home, through peers. Thus, during this time, peers become very influential in attaining this social acceptance (Marrale et al., 1986). Van der Velde (1986) reported that during this time, physical features are "social markers" of oneself. It seems that during this time, appearance primarily dictates social status. It is understandable therefore, to see the relationship between body image and self-image. Secord and Jourard (1953) reported a moderate correlation between body and self-concepts ($r = .58$ for males and $r = .66$ for females), therefore demonstrating a positive relationship between satisfaction with body image and self-concept. Comer (1984) stated that body image affects

self-confidence which in turn influences the goals a person attempts. The importance of a positive body image and its role in the development of self-concept is evident when considering the fact that, as reported by Marrale et al. (1986), "patterns established during this phase often remain for the duration of the life cycle" (p. 17).

Body Image

The occurrence of physical changes result in the adolescent displaying a high degree of concern for her body. A study conducted by Cash, Winstead, and Janda (1986) revealed some interesting data regarding the period of adolescence and its impact upon body image, which is defined as the mental picture one has of his/her body. In this study, it was reported that respondents (both male and female) in their teens and twenties were reported to be the most worried with regard to their physical appearance. However, as age increased, a decrease in concern for looks was noticed. In regards to the effect adolescence played on adult evaluation of body image, it was reported that 48 percent who disliked their bodies during adolesence also disliked their bodies as adults.

Adolescents are typically dissatisfied with their bodies. In a study by Buvat-Herbaut, Hebbinckuys, Lemaire, and Buvat (1983), it was reported that only 50 percent of "normal" females (those not displaying characteristics of an eating disorder) were content with their body size. Using the Body-Self Relations Questionnaire (BSRQ), Cash et al. (1986) reported that 34 percent of males and 38 percent of females (under 20 years of age) did not agree with the statement, "I like my

looks just the way they are". A comparison of 1972 and 1985 respondents given the BSRQ revealed that men and women were increasingly more dissatisfied with their bodies (Cash et al., 1986).

Physical Characteristics

Weight Concerns and Percent Body Fat

Satisfaction with body weight has a large impact on a positive or negative body image. Cash et al. (1986) reported that of the respondents who perceived themselves to be overweight, only 49 percent of the females were satisfied with their appearance. Tobin-Richards, Boxer, and Peterson (1983), as reported by Davis and Furnham (1986), found a linear relationship between satisfaction with body weight and body image in adolescent females. The greatest satisfaction was held by those females who were underweight. In a study of 118 male and 190 female college students, Lerner, Karabenick, and Stuart (1973) reported a high correlation ($p < .05$) between distribution of weight and self-concept. Thus, satisfaction with weight distribution resulted in a more positive self-concept.

If a direct relationship between body weight and body image and/or self-concept does exist, the importance of satisfaction with body weight can not be understated. However, several studies have shown that females possess a greater concern than males with body shape and weight loss (Calden, Lundy, & Schatler, 1959; Cash et al., 1986; Davies & Furnham, 1986; Dwyer & Mayer, 1970; Miller, Coffman & Linke, 1980). A study by the National Center for Health Statistics found that 54 percent

of females surveyed believed themselves to be overweight, with 46 percent attempting to lose weight (Russel, 1986).

In a study of 182 females between the ages of 11 and 18 years, Davies and Furnham (1986) reported similar results. It was found that almost 50 percent desired to lose weight although when compared to standard height/weight tables, few were considered overweight. It was also noticed that older respondents (16 to 18 years) were more dissatisfied with their weight than younger respondents (12 years).

Buvat-Herbaut et al. (1983) reported that 50.7 percent of the 288 school girls surveyed considered their body size to be normal. However, 60.4 percent of the respondents desired to lose weight. It appears that those females who reported themselves to be normal weight, desired to be even thinner.

These findings are in agreement with Cash et al. (1986) who reported that women considered of normal weight were more apt to feel overweight, while those who were underweight actually perceived themselves as normal in weight.

If it is true that body weight is a determinant of a positive body image, there is one discrepancy: body weight does not reflect lean to fat tissue ratio. Often times body weight may be a poor indication of body fatness. For example, a muscular female may appear overweight on a scale, yet possess an acceptable level of body fat. Therefore, it is more important to know the percentage of fat tissue in determining whether weight loss is needed (Hyner, Marconyak, Black, & Melby, 1986).

Physical Condition

It is believed that level of physical condition may also affect

body image and/or self-concept. In one study, 66 college students completed the Body-cathexis and Self-cathexis Scales which measure body image and self-concept, respectively (Secord & Jourard, 1953). It was found that those subjects who participate in regular physical activity (at least 5 hours/week), possess a better body image as well as a higher self-concept (Joesting, 1981).

Cash et al. (1986) reported that a concern for fitness was linked to a positive body image. It was found that respondents who cared about their fitness and health were more satisfied with their bodies.

A positive correlation between physical condition and self-esteem has also been reported. A study of 193 females in grades 7 through 10, demonstrated a direct relation between physical fitness and overall self-esteem (Young, 1985). Tucker (1982), believes this relationship exists because exercise provides positive feedback resulting in an enhanced well being.

Relationship of Body Image to Eating Disorders

The danger of misguided perception of body image is seen in the prevalence of eating disorders. Buvat-Herbaut et al. (1983) believed "thinness misperception is a specific symptom of anorexia nervosa" (p. 57). It was further reported that of 50 percent of normal females surveyed who were satisfied with their bodies, 18 percent reported abnormal eating habits and 23 percent possessed bulimia. It was thus concluded that normal adolescent females frequently possess eating disorders and problems stemming from weight and body image distortions (Buvat-Herbaut et al., 1983).

Killen et al. (1986) found similar results in a study of 1,728 male and female high school sophomores. It was found that approximately 13 percent of those surveyed reported to partake in at least one form of purging behavior (classified as vomiting, laxative use, or diuretic use). It was noted that although the frequency of purging was relatively low, the risk for the development of eating disorders was present when considering the desire to improve upon body image.

In a study by Cash et al. (1986) of 2,000 males and females, it was reported that females in their teens (48 percent) and twenties (46 percent) were reported as having the highest incidence of binging, with females under twenty (11 percent) more likely to purge. It should also be mentioned that those who attempted to alter their body size through dieting, binging, or purging, were found to possess a more negative body image.

It is of importance to note that none of the aforementioned studies attempted to research specific variables which may influence body image. In most cases, a survey was completed and determination of under, over, or normal weight was made in reference to height/weight tables. Certain variables such as body composition or physical condition were not directly measured.

Methods of Measurement

Introduction

As evidenced by Franzoi and Shields (1984), the development of body image is influenced by a variety of factors. It is the attempt of this study to determine the relationship between body composition, physical

condition, and weight concerns of female college freshman and those variables which influence body image.

Body Esteem Scale

The Body Esteem Scale (see Appendix A) was developed by Franzoi and Shields (1984) to assess body image by measuring body esteem, which is defined as the degree of satisfaction one feels with his or her body. This instrument is comprised of a 35 item list of body parts or processes rated using a Likert Scale from 1 (have strong negative feelings) to 5 (have strong positive feelings).

This tool identifies three interrelated factors which together comprise total body esteem. These factors were found to be gender related. For the female, the three aspects involved in body esteem included: sexual attractiveness, physical condition, and weight concerns. The advantage of the Body Esteem Scale over other such tools is that this scale allows for the assessment of each of these individual factors. This was a very important consideration, since the weight concern and physical condition subscales were of primary importance to this study.

Reliability: Alpha coefficients reported for the three subgroups for females were .78 for attractiveness, .82 for general physical condition, and .87 for weight concerns. It was therefore concluded that the Body Esteem Scale was a reliable tool of measure (Franzoi & Shields, 1984).

Discriminant Validity: In order to test for discriminant validity for females, the Body Esteem Scale was administered to anorexic and non-

anorexic females. It was predicted that a difference would be found in the weight concern subcategory with little difference in the other two categories. It was found that only the weight concern subscale discriminated between the anorexic and non-anorexic females (Franzoi & Shields, 1984).

Conclusion: The Body Esteem Scale was shown to be a reliable and valid instrument of measure in the use with a young adult population. While it yields a measure of total body esteem, the Body Esteem Scale also allows for the assessment of physical condition and weight concerns in the female, which was of primary importance in this study.

Hydrostatic Weighing

Introduction: Hydrostatic weighing was the method chosen in this study to predict percent body fat since it is the preferred method (Stamford, 1987). In hydrostatic weighing or underwater weighing, body volume can be determined through measurement of the differences of weight on land to the weight in the water. The volume can then be used to determine density and percent body fat (Noble, 1986). A 2.5 percent error rate was reported by Nash (1985).

Derivation of Formulas: The underwater weighing procedure requires determination of subject weight while submerged in water. Body volume is acquired by subtracting the difference between the weight on land and the weight in water. Body density is then calculated by dividing the weight on land by the body volume ($D = W/V$). From the measure of body density, percent body fat can then be estimated (Stamford, 1987).

By measuring body mass of the subject (MA) in air and body volume

(MW), density can be determined. Body volume is obtained from the displacement of water (MA - MW). The density of water (DW), corresponding to water temperature, must be accounted for (Behnke & Wilmore, 1974).

Determination of body density also requires correction for residual volume (RV), which is defined as the amount of air remaining in the lungs after maximal exhalation, and the air in the gastrointestinal tract (GI tract). A correctional factor of .1 liter is generally used (Doxey, 1984). The following formula is used to determine body density (Buskirk, 1961):

$$BD = \frac{MA}{\frac{(MA-MW)}{DW} - RV - .1\ L}$$

Percent body fat can then be determined from body density. Brozek, Henschel, Anderson, & Keys (1983), developed the following equation:

$$\% \text{ Fat} = \frac{457}{BD} - 414.2$$

Residual Volume

Introduction: The accuracy of the hydrostatic weighing procedure is dependent upon the ability to determine the amount of air present in the lungs at the time of the underwater weighing procedure (Thomas & Etheridge, 1980). Residual volume (RV) is the lung volume used most since it is believed to be the least affected by hydrostatic pressure (Timson & Coffman, 1984; Thomas & Etheridge, 1980; Weltman & Katch, 1981).

Description of the Method: The two most commonly used methods for RV determination are the open- and closed-circuit approaches (Wilmore, 1969). However, no significant differences in RV have been found between the two (Sloan & Bredell, 1973; Wilmore, 1969). A description of the closed-circuit method is discussed since this was the method used in the present study.

The closed-circuit technique requires the rebreathing of a gas in a closed system. After a maximal exhalation, the subject is required to breath deeply into a rubber rebreathing bag filled with a measured amount of pure oxygen until nitrogen equilibrium between the rebreathing bag and the subject's lungs is obtained. Analysis of the mixture in the rebreathing bag yielded the nitrogen percentage. Residual volume could then be calculated.

Validity and Reliability: Wilmore (1969) established validity of the above technique through comparison of the nitrogen washout method described by Darling, Cournand, & Richards (1940). Using twenty subjects who were tested twice on each method, no statistical significance was found between the two methods. Thus, "...the intercorrelational coefficient of $r = 0.958$ indicated that the degree of common variance of the individual mean values for the two methods was extremely high ($r = 0.918$)" (Wilmore, 1969; p. 98).

Reliability of the above method was established by performing duplicate RV determinations on 195 males and 102 females. High correlations were found for both: males, $r = 0.993$; females, $r = 0.987$ (Wilmore, 1969).

Maximal Aerobic Power

Introduction: Direct measure of maximal aerobic power, obtained through a Max VO_2 test, was the method used to indicate level of physical condition. The function of a Max VO_2 test is to determine the cardiorespiratory fitness level, which is one of the primary components of physical fitness (Pollock, Schmidt, & Jackson, 1980).

Maximum oxygen uptake has been found to be strongly related to the cardiac output and arterial venous oxygen difference (av - O_2 difference) and is considered the best measure of the O_2 transport system. It is for this reason that Max VO_2 is the measure most commonly used in determining cardiorespiratory fitness (Pollock et al., 1980).

Description of the Method: The Max VO_2 procedure requires the subject to perform some type of aerobic exercise, the treadmill and bicycle ergometer being the two most common, to exhaustion while O_2 and CO_2 are analyzed (Vogel, Patton, Mello, & Daniels, 1986). Bicycle ergometry generally results in a lower Max VO_2 value due to premature stopping as a result of quadricep muscle fatigue for those unaccoustomed to bike riding. It is for this reason that treadmill testing is preferred (Pollock et al., 1980).

The measurement of maximal aerobic power (Max VO_2) involves the measurement of oxygen consumption during increasing workloads. Some of the accepted criteria for Max VO_2 tests include: (1) exercise modality which promotes the use of a large muscle mass, (2) use of equipment that is stationary, (3) use of equipment that has measurable workloads, (4) intensity strenuous enough to elicit some anaerobic metabolism, and (5)

a protocol which is adequate to the population being tested.

A 2.5 percent error of measurement has been reported (Taylor, Buskirk, & Henschel, 1955).

Parameters to be Measured: Using the Beckman Metabolic Measurement Cart (Beckman MMC), the following variables are measured per minute during the Max VO_2 test: (1) minute ventilation (V_e), (2) absolute and relative volume of oxygen consumed (VO_2), (3) the volume of carbon dioxide produced (VCO_2), (4) percent of oxygen in the expired air (FeO_2), (5) percent of carbon dioxide in the expired gas ($FeCO_2$), and (6) the respiratory exchange ratio (R).

Of the above variables, the respiratory exchange ratio (R) and the volume of oxygen consumed (VO_2) are two physiological parameters used to determine whether true max has been obtained. An R greater than or equal to 1.0 is believed to indicate the prominence of the anaerobic threshold (de Vries, 1986), therefore indicating achievement of maximal oxygen consumption. It is unlikely that max could be obtained with an R of less than 1.0.

It has also been suggested that a plateau of the volume of oxygen consumed (VO_2) serves as an indication of true max (Taylor et al., 1955). It is generally accepted that an increase in VO_2 should not exceed 150 ml per minute.

Lastly, it should be noted that the relative value of VO_2 (in $ml/kg^{-1}/min^{-1}$) during the last minute of exercise yields the Max VO_2 value, assuming the above criteria are met. Cardiorespiratory fitness can then be evaluated through comparison of established norms.

Desired Weight

Measurement of body weight was analyzed not only because it was a factor in the weight concern subcategory of the Body Esteem Scale, but also because of the prevalence of body weight dissatisfaction in females (Cash et al., 1986; Young & Reeve, 1980; Buvat-Herbaut, 1983; Davies & Furnham, 1986). As recommended by Stamford (1987), acceptable percent body fat for females ranges from 19 to 25 percent. Therefore, using this range, and the subject's weight and percent body fat, the following formula by Jackson & Pollock (1985) can be used to determine desired body weight:

$$\text{Desired Weight} = \frac{\text{Weight} - [\text{Weight} \times (\% \text{ BF}/100)]}{1-x}$$

where: x = the desired percent body fat level in decimal form

% BF = percent body fat of the subject

Supplemental Questionnaire: In order to compare subjective and objective measures of body weight, a few supplemental questions pertaining to body weight ideals were asked (see Appendix B).

Summary

Adolescent females are extremely concerned with physical appearance and social acceptance. It has been suggested that it is during this time that physical characteristics dictate social status (Van der Velde, 1986). In addition, it is believed there exists a direct relationship between satisfaction with physical characteristics and a positive self-image (Comer, 1984; Secord & Jourard, 1954). Therefore, the importance of a positive body image cannot be understated.

A review of the literature suggests that females tend to have a negative body image. Not only did each study report dissatisfaction among females regarding physical appearance, but a majority of the studies reported body weight to be the primary concern (Buvat-Herbaut et al., 1983; Cash et al., 1986; Calden et al., 1959, Davies & Furnham, 1986; Dwyer & Mayer, 1970; Miller et al., 1980).

Various factors may influence the development of body image, however three variables were discussed in this chapter: weight concerns and percent body fat, and physical condition. It has been reported that there exists a positive relationship between satisfaction with body weight and positive body image (Cash et al., 1986; Davis & Furnham, 1986; Lerner et al., 1973). A direct relation between positive body image and good physical condition is also believed to exist (Cash et al., 1986, Joesting, 1981; Young, 1985, Tucker, 1982).

The dangers of a negative body image may be witnessed in the prevalence of pathogenic weight control behaviors such as anorexia nervosa or bulimia. In addition, many of the studies reported that abnormal eating habits were prevalent in females of normal weight due to a misperception of body image (Buvat-Herbaut et al., 1983; Killen et al., 1986; Cash et al., 1986). It was therefore the intent to study the relationship between body image and percent body fat, physical condition, and weight concerns in female college freshman. The objective measurement of body image as assessed through the Body Esteem Scale was compared to the direct measurement of factors influencing body image, yielding a discrepancy, if any, between perceived and actual factors.

CHAPTER III

METHODOLOGY

Introduction

This study was conducted to compare the perceptions of body image variables, obtained through an objective tool of measure, to direct measurement of select variables which influence body image. The variables chosen included body composition, physical condition, and weight concerns. By comparing the perceptions of the respondents on the above factors to direct physical measure, discrepancy between the two, or lack thereof, was evaluated. Thus, any quantifiable difference between the subjective measure (perception) and the direct measures (body composition, physical condition, and weight concerns) was investigated.

Subject Selection

Thirty-three female college freshman from the University of Wisconsin - La Crosse were randomly chosen. The ages ranged from 18 to 20 years old, with a mean age of 18.8. It was the intent to study non-anorexic and non-bulimic females; therefore, all subjects participating were screened for these eating behaviors (see Appendix B). Any subject possessing either anorexia nervosa or bulimia continued in the study, however any data obtained was analyzed separate from non-anorexic and non-bulimic subject data.

In an attempt to obtain a representative sample of females of various

weights, confidentiality and anonymity was assured. In addition, a resource listing concerning reducing and weight control information was offered as incentive to those interested (see Appendix C).

Obtaining the Sample

Using a table of random numbers, the random sample was obtained from a computer printout of the college enrollment records obtained from the Registrars Office. A total of 60 names were identified from the enrollment printout list.

Once the random sample had been identified, it was necessary to contact those in order to request their participation. A letter was sent explaining the need for their involvement (see Appendix D). Three to five days later, each student was telephoned in order to determine whether or not they would participate. Testing appointments were made for those who agreed. During the telephone conversation, the subject was reminded of the pre-testing guidelines which were received with the initial letter (see Appendix E). Of those who agreed to participate, a total of 33 completed all of the necessary requirements of the study.

General Procedure

Each subject was required to make two one-hour visits to the Human Performance Laboratory (HPL) at the University of Wisconsin - La Crosse. On the first visit, the subject signed an informed consent form (see Appendix F) and then completed the Body Esteem Scale (see Appendix A) and the supplemental questionnaire attached (see Appendix B). Upon completion, the inventory and questionnaire were placed in a sealed

envelope. In addition to the above, the subject underwent a hydrostatic weighing process. On the second meeting, a VO_2 Max test was performed.

Instrumentation

The Body Esteem Scale

The Body Esteem Scale was used to assess body image. This tool required the subject to rate how she felt about certain body parts using a five-point Likert Scale. A total body image score was then determined by summing the numbers. In addition, a score for each individual subscale (sexual attractiveness, physical condition, and weight concerns) was also totaled.

Supplemental Questionnaire

The primary purpose of the supplemental questionnaire was to identify self-perception of body weight and self-perception of ideal weight. It also served to screen for those subjects who possessed anorexia or bulimia.

Desired Weight

Desired body weight was calculated using the following formual by Jackson and Pollock (1985):

$$\text{Desired Weight} = \frac{\text{Weight} - [\text{Weight} \times (\% \text{ BF}/100)]}{1-x}$$

where: x = the desired percent body fat level in decimal form

% BF = percent body fat of the subject

In the present study, the desired percent body fat (x) ranged from 19 - 25 percent. Thus, using the assessed percent body fat from the underwater weighing procedure, a range for desired weight was identified

for each subject. The midpoint from this range was used in the statistical analysis.

Height and Weight

The subject was weighed to the nearest .25 pound (.50 kg) on a calibrated Health-O-Meter scale while barefoot and in the attire which would be worn during the hydrostatic weighing procedure. Height was measured to the nearest .25 inch (.50 cm).

Residual Volume

A closed circuit oxygen dilution method as outlined by Wilmore, (1969) was used to determine RV. All RV tests were conducted using a calibrated Collins Nitrogen Analyzer (model #505) in a seated position outside the weighing tank. Prior to the test, the system was flushed out twice, and filled with 3 to 5 liters of 100 percent oxygen. The procedure was then explained to the subject. With the subject seated and wearing a nose clip, the subject placed their mouth on the mouthpiece and was instructed to breath normally. A maximal inhalation was taken followed by a maximal exhalation. The subject signaled that exhalation was complete by holding one finger in the air. The tester then closed off the valve to room air, connecting the subject to the breathing bag. The subject was asked to continue breathing in and out deeply until equilibrium was reached. Two trials were taken.

The following equation was used to calculate RV (Wilmore, 1969):

$$RV = \frac{VO_2 \ (EN_2 - IN_2)\text{-}DS}{AN_2 - FN_2} \times \text{BTPS factor}$$

where:

RV = residual volume

VO_2 = initial volume of O_2 present in system

EN_2 = amount of nitrogen when equilibrium is reached

IN_2 = impurity nitrogen initially in VO_2

AN_2 = alveolar nitrogen present when breathing room air

FN_2 = alveolar nitrogen at termination of test

DS = dead space in connecting tubes between subject and apparatus

The BTPS conversion factor used was 1.1 assuming the gas in the analyzer was 20 degrees celsius.

Hydrostatic Weighing

The hydrostatic weighing procedure was used to estimate body density from which percent body fat was predicted. Upon completion of RV determination, the subject was directed to put on her swimsuit and void her bladder if needed. The subject was then instructed to shower, at which time the researcher recorded the temperature of the water in the tank. Once the subject was in the tank and submerged to the neck, the weight of the apparatus was recorded. The subject then sat on the weight chair and removed any air bubbles from the suit or skin. The procedure was explained and any questions were answered. The subject then expired as much air as possible as she gradually submerged. After the weight was noted, the researcher tapped on the tank to signal the subject to come up. The weight was recorded to the nearest .25 kg. Eight to ten trials were recorded.

The following equation was used to determine body density (Buskirk, 1961).

$$BD = \frac{MA}{\frac{MA-MW}{DW} - RV - .1}$$

where:

BD = body density

MA = mass of body in air (kg)

MW = mass of body in water (kg)

DW = density of water

RV = residual volume

.1 = correctional volume for air in GI tract

From body density, percent body fat was determined using the following equation (Brozek et al., 1983):

$$\% \text{ BF} = \frac{457}{\text{BD}} - 414.2$$

where:

% BF = percent body fat

BD = body density

Maximal Oxygen Uptake

The second appointment consisted of completion of a maximal oxygen uptake (VO_2 Max) treadmill test. Prior to testing, the subject was instructed on the procedure and, if unfamiliar with treadmill use, allowed to practice walking/running on the treadmill. The actual testing was started when the subject felt comfortable with its use.

The Butt's protocol (Butt's, 1982; see Appendix G) was used. This protocol was chosen since the grade limit did not exceed 10 percent, thus, the likeliness of exhaustion due to muscle fatigue was reduced. Using high school runners, the test-retest reliability for the Butt's protocol was shown to be 0.96 (Butt's, 1982).

The Butt's protocol allows for a 5 minute warm-up at 5 mph and 0

percent grade. After the fifth minute, the speed was increased to 6 mph. Every third minute thereafter, the grade was increased 2.5 percent, however, not to exceed 10 percent. After the 13th minute, speed instead of grade, was then increased .5 mph.

Termination of the test resulted at the subject's request, whereupon the subject cooled down on the treadmill at walking pace. A respiratory exchange ratio (RER) of greater than or equal to 1.0 and an increase in oxygen consumption not to exceed 150 ml per minute during the last two minutes were the accepted criteria indicating true max was obtained. Data not meeting the above specifications were not included in the final analysis of the physical condition subcategory.

Heart rate determination

During the entire test, heart rate was determined using a one-lead ECG monitoring system. Electrodes were placed on the right arm, right leg, and left leg locations. Heart rate was monitored continuously using an oscilloscope. Graphic recordings were taken the last 15 seconds of each minute for heart rate determination, which entailed counting the number of cardiac cycles (R waves) and multiplying by four.

Ratings of Perceived Exertion

Rating of perceived exertion (RPE) were obtained at two minute intervals beginning at the 4.5 minute continuing through exhaustion. The Borg scale (1970) which ranges from 6 to 20 with 7 being "very, very light" and 19 being "very, very hard". Prior to testing, the Borg scale was explained to each subject in exactly the same manner (Butt's, 1982).

Beckman Metabolic Measurement Cart

Analysis of gas samples were taken each minute using a Beckman

Metabolic Measurement Cart (Beckman MMC), which is based upon open-circuit spirometry. Calibration of the gas analyzers (LB-2 CO_2 analyzer and OM-11 O_2 analyzer) took place at the beginning and end of each test. Adjustment of mercury barometric pressure and thermometer to lab conditions took place daily at the beginning of each testing situation. During each minute of the treadmill test, V_e, VO_2, VCO_2, and RER were computed by the Beckman MMC and printed on the machines output tape.

Statistical Analysis

Means, standard deviations and ranges were determined for height, weight, percent body fat, VO_2 Max, all body image variables, and physical fitness variables. Stepwise regression equations were used to determine the relationship between the body image variables (physical condition, weight concerns, and sexual attractiveness subscales) and percent body fat, and VO_2 Max. A one-factor MANOVA was performed to determine the relationship between body image variables and self-perception of body weight. A one-way ANOVA was employed to identify the relationship between self-perception of body weight and measured body fat percentage. The Pearson Product Moment correlation was used to determine the relationship between self-perceived ideal body weight (perception) and desired body weight (measured).

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to examine within college female freshmen the relationship between body image and the physical characteristics of body composition, physical condition, and weight concerns. Body image was measured by Franzoi and Shield's Body Esteem Scale (1984). Body composition was determined through underwater weighing; physical condition was assessed from a VO_2 Max treadmill test; and weight concerns were obtained using Jackson and Pollock's desired weight formula (1985) and information obtained from a supplemental questionnaire on weight concerns. The study was conducted at the University of Wisconsin - La Crosse using female freshmen only. The significance level for all statistical procedures was set at .05.

Physical Characteristics

Means, standard deviations and ranges for height, weight, percent body fat, and VO_2 Max are reported in Table 1, which is broken down by weight perception and also expresses the means and standard deviations for the sample as a whole. As expected, the weight and percent body fat values increased as weight perception progressed from those self-categorized as "little underweight" to "moderately to very overweight". Conversely, Max VO_2 decreased with the exception of the "little underweight" category, as weight perception increased. However,

Table 1. Means and standard deviations of physical characteristics for total sample broken down by self-perception of weight condition (N = 33).

Characteristic	Weight Perception									
	Little Underweight (n=1)		About Right (n=8)		Little Overweight (n=18)		Mod to Very Overweight (n=6)		Total Sample (n=33)	
	X	SD	X	SD	X	SD	X	SD	X	SD
Height	65.0	.00	64.8	1.94	64.9	2.03	64.8	1.93	64.8	1.90
Weight	119.0	.00	121.1	9.05	142.0	13.5	145.5	12.0	136.9	15.4
Percent Body Fat	17.8	.00	21.2	2.71	25.6	4.9	26.2	4.83	24.4	4.79
Max VO_2	43.5	.00	49.6	5.08	44.2	4.9	43.9	4.3	45.4	5.19

only one subject placed herself in the weight perception category of "a little underweight" and therefore is not suitable for comparison among the means of the groups. Means and standard deviations for all body image and weight variables can be found in Appendix H.

Body Image and Percent Body Fat

The first null hypothesis to be tested stated that there would be no significant relationship between body image variables and percent body fat as determined by underwater weighing. Using multiple regression, it was found that the weight concern subscale was the only significant variable ($p = .0005$) in predicting percent body fat. The other subscales, physical condition and sexual attractiveness, were not statistically significant. The strength of the effect as indexed by r squared was .308 indicating that approximately 31 percent of the variance in percent body fat can be explained by differences in scores on the weight concern subscale (see Table 2).

The fact that the weight concerns subscale related significantly with percent body fat shows the subjects perception of those physical characteristics associated with weight concerns were not too distorted. An inverse relationship existed between the weight concern subscale and percent body fat, such that as percent body fat increased, the score of the weight concern subscale decreased. In other words, those who were of greater percent body fat were the least satisfied with regards to the weight concern subscale.

Table 2
Stepwise Multiple Regression for Prediction of Body Fat
Body Image Variables by Percent Body Fat

Source	df	SS	MS	F ratio	Sig F
Regression	1	242.6	242.6	15.3	.0005
Residual	31	491.6	15.9		
Total	32				
Adjusted r^2 = .3088					

Body Image and VO_2 Max

The second null hypothesis stated that there is no significant relationship between body image variables and physical condition of female college freshmen as determined by a VO_2 Max treadmill test. A stepwise regression analysis showed no significance between the body image variables and measured level of physical condition. Thus, none of the body image subscales predicted VO_2 Max. Since the VO_2 Max test was used to determine level of physical condition, the physical condition subscale was the body image variable expected to predict VO_2 Max. However, the fact that the physical condition subscale was not significant suggests that the subjects' satisfaction with physical condition was not related to their assessed level of physical condition. Thus, the subjects' perceptions in this area do not match their physiological condition.

Body Image and Weight Perception

The third null hypothesis stated that there is no significant relationship between body image variables and self-perception of body weight. Using Multivariate Analysis of Variance (MANOVA), the three body image variables, taken together, were found to be significantly different between the three body weight perception groupings ($F = 4.13$, $p = .002$; see Table 3). This indicated that sexual attractiveness, physical condition, and weight concerns collectively played a role in the assessment of self-perception of body weight in female freshmen.

Further analysis using a univariate test of significance revealed that only the weight concern subscale played a significant role in predicting body weight groupings ($F = 12.80$, $p < .001$). This indicated that of the three subscales, the weight concerns subscale played the most important role in relation to weight perception of female freshmen.

Table 3
ANOVA
Body Image Variables by Weight Perception

Test	Hypothesis df	Error df	F	p
Multivariate ANOVA	6	54	4.13	.002
Univariate ANOVA (weight concerns)	2	29	12.8	.000
Univariate ANOVA (physical condition)	2	29	1.02	.373
Univariate ANOVA (sexual attractiveness)	2	29	1.51	.238

The nature of the above proved to be an inverse relationship such that as total score on the weight control subscale increased (meaning more satisfaction), the subjects perceived themselves to be in a lower weight perception category.

Percent Body Fat and Weight Perception

Hypothesis Four stated there is no significant relationship between percent body fat and weight perception. A one-way analysis of variance (ANOVA) was performed comparing the means of the three weight perception groups (Group 3 - about right, Group 4 - little overweight, and Group 5 - moderately to very overweight). No significance was found between percent body fat and weight perception, indicating that the subjects' self-perception of body weight were not significantly related to percent body fat measures ($F = 3.09$; $df = 2, 29$; $p = .06$).

Ideal Body Weight and Desired Body Weight

Null Hypothesis Five stated that there is no linear relationship between self-perceived ideal body weight and desired body weight as calculated by Jackson and Pollock's Desired Body Weight Formula. The results of the Pearson Product Moment correlation revealed a high linear relationship ($r = .84$, $p < .001$) between perceived ideal body weight and calculated desired body weight. These results indicated that there was a significant relationship between subject perception of ideal body weight and calculated body weight standard. Regression analysis revealed a slope of .65 and intercept of 36.9. Further

examination of the slope and intercept showed that as calculated desired body weight increased, perceived ideal body weight decreased.

Discussion

The results of this study indicate that the subjects were perceptive in certain areas, while less perceptive in others. With regards to percent body fat and body image, it was found that the weight concern subscale was a significant predictor of percent body fat. As percent body fat increased, there was a significant decrease in total points on the weight concern subscale. In other words, those subjects who possessed lower percentages of body fat were more satisfied with their body in regards to the weight concern aspects of the Body Esteem Scale.

In regards to the status of physical condition, the subjects' perceptions were incorrect since their was no correlation between Max VO_2 and the physical condition subscale. It would appear that the subjects were not correct in their assessment of their level of physical condition. The reason for this may be because of a lack of norms upon which to judge oneself. It is possible that since a majority of the subjects were not competitive athletes, they had little exposure to how their level of physical condition ranked among their peers.

It is also possible that activity patterns changed from the high school to the college setting, resulting in a harsher judgement by the subjects as to their physical condition. For example, if the subjects were more active in high school than presently during their first year

of college, their perception of their physical fitness may have been unacceptable to them; yet actual assessment of physical condition proved to be acceptable.

Using multivariate analysis, significance was found between the three body image subscales and the subjects' weight perception (little underweight, about right, little overweight, and moderately to very overweight). As found with percent body fat and weight concern subscale, the lower the weight perception category, the better the subjects felt about all three areas of body image. This in and of itself is important in that the subjects' perception (be it distorted or not) was related to satisfaction of the body image variables. Again, the importance of a non-distorted body image is apparent. Since perception correlates with body satisfaction, the subject's perception ought to be an accurate one.

It should be noted that the weight concerns subscale was found to be the only significant subscale in relation to weight perception by the subject when univariate analyses were run. The reason for this may be due to the fact that the weight concern subscale addressed those variables more directly pertaining to the judgement of weight perception. For example, the weight control subscale consisted of assessment of such items as waist, thigh and stomach while the sexual attractiveness subscale addressed such aspects as body scent, lips, and breasts.

The relationship between percent body fat and weight perception was found to be insignificant. This would suggest that based upon percent body fat, the subjects perceptions were distorted when categorizing

themselves into weight perception groups. Upon closer analysis of each weight perception group, it was noticed that some subjects had indeed placed themselves into an inappropriate weight perception category. The minimum body fat percentage in weight perception Group 3 ("about right") was 16.1 percent, with the maximum value being 24 percent. Of the eight subjects who categorized themselves in Group 3, all except one were correct in their classifications when assuming the acceptable level of percent body fat ranges from 19 to 25 percent. The subject with 16.1 percent body fat could be classified as a little underweight.

While those in Group 3 correctly categorized themselves based upon percent body fat, the same is not true in regards to Group 4 ("little overweight"). In Group 4, the minimum value was 15.4 percent with the maximum at 30.6 percent. Of the 18 subjects who categorized themselves in weight perception Group 4, seven were of acceptable body fat levels. It would appear that members of Group 4 had more distorted perceptions of weight than Group 3.

In weight perception Group 5 ("moderately to very overweight"), the minimum fat percentage was 19.9 percent and the maximum was 30.9 percent. Of the seven who classified themselves in this group, two were of acceptable body fat levels.

Taking all weight perception groups into account, a total of ten subjects, or 30 percent, had misperceived their weight category. Of this, 27 percent had wrongly classified themselves into a higher weight perception category.

The fact that the subjects were distorted in their judgements when classifying themselves into a weight perception category is important

when considering the results obtained from Hypothesis Three which studied the relationship between the body image subscales and subject weight perception. As mentioned earlier, the lower the weight perception category, the greater degree of satisfaction one felt with all three areas of body image. However, in the present study, it was found that the subjects held distorted perceptions with regards to weight perception classification. In fact, there was a tendency towards placement in a higher weight perception category than normal, thus possibly resulting in less satisfaction with body image.

Lastly, a high correlation was found between the subjects' perceived ideal body weight, and actual measurement of the subjects' desired body weight. Regression analysis of the slope (.65) and intercept (36.9) revealed that those subjects who weighed less were more accurate in their assessment of ideal body weight then subjects who weighed more. In subjects of greater weights, self-perception of ideal body weight was lower than the calculated desired body weight. This would suggest that there is an upper acceptable limit to body weight which females feel they should not go beyond. This "limit" has no bearing upon acceptable percent body fat ranges. This may explain why, in Hypothesis Four, the subjects were distorted in their assessment of weight perception.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to compare perceived body image variables to body composition, physical condition, and weight concerns of female college freshmen, 18 to 20 years of age, at the University of Wisconsin - La Crosse.

The body image assessment tool used was the Body Esteem Scale developed by Franzoi and Shields (1984). Body composition (percent body fat) was determined through hydrostatic weighing, physical condition was measured using a VO_2 Max treadmill test, and desired weight was calculated using Jackson and Pollock's Desired Weight Formula (1985). A supplemental questionnaire provided additional information regarding weight concerns and physical activity (i.e. weight perception, ideal weight, and amount of aerobic & nonaerobic activity).

In relation to body composition, the weight concern subscale was found to be a significant predictor of percent body fat. A significant relationship was identified between the three body image variables and weight perception. Also, a very high correlation was identified between self-perceived ideal body weight and measured desired body weight, however no significance was found between percent body fat and weight perception.

With regards to physical condition, it was found that the physical condition subscale did not predict VO_2 Max.

Conclusions

The following conclusions were formulated from the present study:

1. The weight concern subscale was significantly related to percent body fat. This supports the premise that body satisfaction increases as the percent body fat decreases.

2. The physical condition subscale did not relate to VO_2 Max, thus indicating an incorrect perception of physical condition by the subject.

3. The weight concern subscale proved to be the most important subscale in relationship to self-perceptions of weight. This suggests that self-perception of body weight (be it correct or incorrect) can influence body image, thus displaying the importance of a nondistorted body image.

4. The subjects' perceptions of weight was not related to percent body fat, indicating an incorrect perception of weight

5. A strong correlation between self-perceived ideal body weight and calculated desired body weight was found. Further examinations showed that as calculated desired body weight increased, perceived ideal body weight decreased, indicating that subjects of greater weights were more distorted in their perceptions of ideal body weight.

Implications of the Study

The results of this study suggest that certain areas of body image in females require attention. The fact that body satisfaction increased

as percent body fat decreased indicates that females feel happier at lower weight levels. It would seem obvious that the lower the percentage of body fat in a subject, the more satisfied the subject feels about her body, however, how low does percent body fat become before optimal body satisfaction is reached? If lower percentages result in better body images, then the risk of sub-optimal body fat percentages is possible. For example, as reported by Davis and Furnham (1986) in a study of adolescent females, the greatest degree of satisfaction with body weight was held by underweight females. Ideally, those with an acceptable body fat range should be satisfied with that aspect of body image.

Regarding self-perception of weight, those who classified themselves into a lower weight perception category were more satisfied with body image variables. Since the subjects perception was related to body image, the importance of an accurate assessment is evident. However, in the present study, it was found that subjects were distorted in relation to self-perception of body weight such that approximately one-fourth of the sample classified themselves into a higher weight perception category.

It was also found that the subjects could not correctly assess level of physical condition. It is possible that such physical characteristics as physique and tone may be more important than cardiovascular fitness in the assessment of body image.

The nature of the above findings imply that alterations need to be made to correct distorted perceptions. There is a need to establish widely known acceptable ranges for percent body fat. It would be

helpful to create interest in females to have percent body fat tested (such as has been the push to have cholesterol screened) in order to increase awareness of these ranges. In doing so, this might aid in a more accurate assessment of self-perceived body weight resulting in increased satisfaction with body image variables. This would also provide females the opportunity to correctly assess body weight in pounds and hopefully put to rest the misconception that there is an ideal weight which females should not exceed. The desired result would be a more accurate self-perception of weight leading to increased body satisfaction.

The need to educate and assess females also holds true for physical condition. It was found that the subjects were unable to accurately assess their level of physical condition. As reported by Cash et al. (1986), there existed a relationship between those subjects who reported concern for fitness and a positive body image. Therefore, it is necessary to create not only an interest in, but an understanding of, cardiovascular fitness parameters. The ultimate goal again being to promote an accurate assessment of individual physical condition as well as enhancement of a positive body image.

As a point of interest, it was found that while the weight concerns and the sexual attractiveness subscales were related, as were the weight concerns and physical condition subscales, there was no significant relationship found between sexual attractiveness and physical condition. Thus, it might be concluded that, for females as least, self-perception of sexual attractiveness is independent of physical condition, possibly relying heavily upon weight concerns. It appears that there needs to be

an increased awareness of the importance of cardiovascular fitness in self-worth instead of simply good looks.

Recommendations

The following are recommendations in regards to further investigation:

1. Further research involving the relationship of body image and physical parameters in younger adolescents (age 12 to 15 years).

2. Comparison of the differences in perception of body image and measured physical characteristics between males and females.

3. Comparison of the relationship between physical condition and body image in athletes and nonathletes.

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Appendix A

THE BODY ESTEEM SCALE

Instructions: On this page are listed a number of body parts and functions. Please read each item and indicate how you feel about this part or function of your own body using the following scale:

1- Have strong negative feelings
2- Have moderate negative feelings
3- Have no feeling one way or the other
4- Have moderate positive feelings
5- Have strong positive feelings

---

1. body scent _____
2. appetite _____
3. nose _____
4. physical stamina _____
5. reflexes _____
6. lips _____
7. muscular strength _____
8. waist _____
9. energy level _____
10. thighs _____
11. ears _____
12. biceps _____
13. chin _____
14. body build _____
15. physical coordination _____
16. buttocks _____
17. agility _____
18. width of shoulders _____
19. arms _____
20. chest or breasts _____
21. appearance of eyes _____
22. cheeks/cheekbones _____
23. hips _____
24. legs _____
25. figure or physique _____
26. sex drive _____
27. feet _____
28. sex organs _____
29. appearance of stomach _____
30. health _____
31. sex activities _____
32. body hair _____
33. physical condition _____
34. face _____
35. weight _____

THE BODY ESTEEM SCALE

(Scoring Keys)

To determine subject's score for a particular subscale of the Body Esteem Scale, simply add up the individual scores given items on the subscale. For example, for female sexual attractiveness you would add up the subject's ratings of the items comprising the sexual attractiveness subscale (13 items).

FEMALES

Sexual Attractiveness: body scent, nose, lips, ears, chin, chest or breasts, appearance of eyes, cheeks/cheekbones, sex drive, sex organs, sex activities, body hair, face

Weight Concern: appetite, waist, thighs, body build, buttocks, hips, legs, figure or physique, appearance of stomach, weight

Physical Condition: physical stamina, reflexes, muscular strength, energy level, biceps, physical condition, agility, health, physical coordination

MALES

Physical Attractiveness: nose, lips, ears, chin, buttocks, appearance of eyes, cheeks/cheekbones, hips, feet, sex organs, face

Upper Body Strength: muscular strength, biceps, body build, physical coordination, width of shoulders, arms, chest or breasts, figure or physique, sex drive

Physical Condition: appetite, physical stamina, reflexes, waist, energy level, thighs, physical coordination, agility, figure or physique, appearance of stomach, health, physical condition, weight

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Franzoi, S. L., & Shields, S. A. (1984). The Body Esteem Scale: Multidimensional structure and sex differences in a college population. Journal of Personality Assessment. 48, 173-178.

SUPPLEMENTAL QUESTIONNAIRE

1. I participate in some form of aerobic exercise at least 3 times per week lasting at least 30 minutes.

___ Yes ___ No

2. If "yes" to #1, please name any and all activities and the frequency performed per week.

Activity	Frequency (days/week)
_____	_____
_____	_____

3. Please list any other form of regular non-aerobic exercise performed and the frequency per week (i.e. weight lifting, yoga, etc...).

Activity	Frequency (days/week)
_____	_____
_____	_____

4. I consider myself

___ moderately to very underweight
___ a little underweight
___ moderately to very overweight
___ a little overweight
___ about right

5. I wish to

___ lose weight
___ gain weight
___ remain at my present weight

6. I would like to weigh _____ pounds.

7. Please check if you possess any of the following eating disorders listed below:

___ anorexia nervosa ___ bulimia

8. I am interested in receiving the Reducing and Weight control resource listing provided.

___ Yes ___ No

Appendix C

REDUCING AND WEIGHT CONTROL
RESOURCE LISTING

NUTRITION SERVICES:

Diet Center of La Crosse
1013 East Avenue South - 784-6810
321 Lange Drive - 784-7588

Luther Hospital
Dial-A-Dietitian - 782-0330
Optifast Program - 785-0503 (x-3192)

Overeaters Anonymous
1910 South Avenue - 782-8010

Nutri-system Weight Loss Center
200 Main Street - 785-0530

Saint Francis
700 West Ave South - 785-0940

Slender Center
505 King - 785-7717
419 Sand Lake Road - 783-7170
(Onalaska)

EXERCISE FACILITIES:

UW - La Crosse Aerobics - 785-8696

Sports Trek Fitness Center
4008 Mormon Coulee Road - 788-0274

Jazzercise
3419 East South 29th Court - 788-9598

Cybex Center
505 King - 784-8750

RECOMMENDED READING MATERIAL:

Fit or Fat
Covert Bailey
1978, Houghton Mifflin Co.

The Athletes Kitchen
Nancy Clark, MS RD
1983, Bantam Books

Weight Management: Current Theory and Practice
1985, National Dairy Council
Rosemont, IL 60018-4233

Appendix D

Letter to Request Involvement

Date _____

Dear _____:

YOUR HELP IS NEEDED! Today there is a growing interest in a variety of personal health and fitness parameters. In view of this, many fitness and clinical settings provide services to determine body composition and physical fitness at an expensive cost to the consumer. Because of this increasing emphasis on body composition and physical fitness, a graduate study is being conducted to assess the current status of the above in female college freshman.

I am happy to inform you that you have been chosen, at random, to participate in this important research. What this study involves is two brief testing situations in the Human Performance Laboratory at Mitchell Hall.

All testing will be strictly confidential with only myself and one other assistant present. Complete anonymity is ensured to all who participate. Also, a reducing and weight control resource listing will be available for those interested.

Because you were randomly chosen, I would greatly appreciate a small amount of your time to partake in this study. Please, your assistance is needed.

I look forward to meeting you and will contact you in the near future. Thank you in advance for your time and consideration regarding this study.

Sincerely,

Lisa A. Heusch
Adult Fitness/Cardiac Rehabilitation
Graduate Student

Appendix E

PRE-TESTING GUIDELINES

All evaluations will be conducted at the Human Performance Laboratory, Room 225, Mitchell Hall.

Assessment of Body Composition:

The underwater weighing evaluation is designed to assess one's body composition. More specifically, the purpose is to calculate one's percentage of body fat. This procedure has been substantiated as being very accurate and reliable. Due to the nature of the assessment, special preparation is required by you. Listed below are the responsibilities you have to meet to make your assessment the best possible.

1. Do not eat anything for 4-6 hours prior to appointment.
2. Please bring a light swimsuit, preferably nylon or thin cotton and a towel.
3. Before reporting to the immersion tank, empty your bladder and bowels, if necessary.
4. Do not exercise on the same day of the test prior to being tested.

Assessment of Physical Condition:

Cardiovascular fitness will be evaluated through performance on a treadmill test. Listed below are the pre-testing guidelines we ask that you follow.

1. Do not eat anything for 2 hours prior to appointment.
2. Please report dressed in shorts, t-shirt, and running shoes.
3. Do not exercise on the same day of the test prior to being tested .

If unable to attend scheduled time, please contact Lisa Heusch at 782-3198, or leave a message at the Human Performance Lab, 785-8692.

Thank you for your cooperation. See you soon!

Appendix F

Informed Consent Form

Project Title: Relationship between Body Image and Body Composition, Physical Condition, and Weight Concerns of Female College Freshmen.

Principle Investigator: Lisa A. Heusch

I, _____, understand that I have been randomly selected from all female freshmen college students to participate in a graduate study involving the measurement of body image, body composition, physical condition and weight concerns. I will be asked to sign up for two meeting appointments in the Human Performance Laboratory.

During my first appointment, I will be asked to complete a body image assessment scale and supplemental questionnaire. The individual results of this scale will remain completely anonymous. Body composition or percent fat will be determined by my being fully submerged in an underwater weighing tank. My residual volume, height, weight will also be determined. There exists some risk with hydrostatic weighing such as accident or infection. However, rubber mats have been placed on the floor and the underwater weighing tank has been adequately cleaned to ensure my safety.

On my second visit, I will perform a graded exercise test on a motor driven treadmill, involving work levels of increasing intensity. I understand there exists the possibility of certain changes occuring during the test, such as abnormal blood pressure, fainting, disorders of heartbeat, and very rare instances of heart attack. I may stop the test at any time due to fatigue or discomfort.

At the completion of the studies, I understand I will be given the results of my tests. I further understand that the information which is obtained will be treated as privileged and confidential and will not be revealed to any non-affiliated person without my consent.

To my knowledge, there are no physical reasons why I cannot participate in the tests described above. Any questions I may have regarding procedures may be directed to the researcher periodically through-out the study. I understand that I may withdraw from the study at any time.

Signed _____ Date _____

Witness _____ Date _____

Appendix G

BUTT'S PROTOCOL

Minute	Speed (mph)	Grade (%)
1	5.0	0
2	5.0	0
3	5.0	0
4	5.0	0
5	5.0	0
6	6.0	2.5
7	6.0	2.5
8	6.0	5.0
9	6.0	5.0
10	6.0	7.5
11	6.0	7.5
12	6.0	10.0
13	6.0	10.0
14	6.5	10.0
15	6.5	10.0
16	7.0	10.0
17	7.0	10.0
18	7.5	10.0
19	7.5	10.0

Butts, N. K. (1982). Physiological Profiles of High School Female Cross Country Runners.

Appendix H

Table 4. Means and standard deviations of body image variables for total sample broken down by self-perception of weight condition (N = 33).

Body Image Variable	Weight Perception									
	Little Underweight (n=1)		About Right (n=8)		Little Overweight (n=18)		Mod - Very Overweight (n=6)		Total Sample (n=33)	
	X	SD	X	SD	X	SD	X	SD	X	SD
Sexual Attract. (13-65 pts)	52.0	.00	47.1	5.64	46.3	6.44	41.8	5.64	48.9	6.22
Weight Concerns (10-50 pts)	37.0	.00	35.1	5.84	24.1	7.84	16.8	4.62	25.8	9.26
Physical Condition (9-45 pts)	29.0	.00	35.3	3.41	31.9	7.98	30.3	5.92	32.4	6.72
Total (32-60 pts)	118.0	.00	117.5	12.9	102.7	16.9	89.0	12.7	104.3	17.6

Table 5. Means and standard deviations of weight variables broken down by self-perception of weight condition (N = 33).

Weight Variable	Weight Perception									
	Little Underweight (n=1)		About Right (n=8)		Little Overweight (n=18)		Mod. - Very Overweight (n=6)		Total Sample (n=33)	
	X	SD	X	SD	X	SD	X	SD	X	SD
Weight Loss	1.0	.00	1.63	.518	2.0	.000	2.0	.000	1.88	.331
Ideal Weight ** (Perception)	124.0	.00	116.9	7.99	124.9	9.21	126.0	10.8	123.2	9.70
Desired Weight	125.0	.00	123.7	10.5	135.4	11.6	138.1	13.3	132.7	12.5

** 1.0 = Remain at present weight
2.0 = Lose weight