# Comparisons of Physical Self-Perception of Weight Status and Actual Measures of Body Composition in University Female Athletes and Non-Athletes

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# Self-Perception of Weight Status and Actual Measures of Body Composition in University Female Athletes and Non-Athletes

A Thesis

Presented for the Honors Program

Missouri Southern State University

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Health Promotions & Wellness Major

April 21, 2009

Abstract

Over the past decades, there has been an increase in obesity among college students. Researchers have examined faulty self-perceptions of weight status as one probable cause for this unhealthy weight trend. The purpose of this study was to examine the accuracy of college student's physical self-perception of weight status classification and the relationship between students' self-perceptions of weight status to their actual measures of percent body fat. In addition, university female athletes will be compared to non-athletes. Participants were 50 (25 athletes, 25 non-athletes) female college students. Actual height and weight measurements were taken to calculate percent body fat scores. Individual body fat percentage was determined through bioelectrical impedance analysis method (BIA). In addition, participants voluntarily answered a single questionnaire taken from the third National Health and Nutrition Examination Survey, 1988-94 (NHANES III) in order to assess their own weight status: 'Do you consider yourself now to be overweight, underweight, or about the right weight?" Responses to this question were compared with how subject (n=50) would be classified by medical standards given their recommended body fat ranges (Gallagher et al.). T-test analyses by group type revealed no significant difference in self-perceptions of weight status between athletes and non-athletes; however, university female athletes had significantly lower percent body fat than non-athletes. Spearman's rho correlation revealed a positive significant relationship between self-perceptions of weight status and percent body fat. Chi-square analyses for both athletes and non-athletes revealed that underweight and healthy (right weight) weight

students tended to overestimate their weight status. Results suggest that university female students were less aware of their weight status classification when compared to actual percent body fat measures.

**Comparisons of Physical Self-Perception of Weight Status and Actual Measures of Body Composition in University Female Athletes and Non-Athletes**

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*Research Hypotheses*

Four hypotheses were tested in this study:

(1) University female athletes will report classifications of self-perception of weight status with greater accuracy than non-athletes.
(2) University female athletes will possess lower levels of body fat percent than non-athletes.
(3) There is a relationship between physical self-perception of weight status and actual measures of body composition.
(4) University female athletes will exhibit a stronger relationship between physical self-perception of weight status and body composition than non-athletes.

*Limitations of the Study:*

The following limitations are recognized in the study's design and methods.

1. The research will be limited to university female athletes and non-athletes in the Southwestern part of Missouri at one university. Therefore, the results may only be widespread to a similar population of students.
2. The statistical power of the findings in this study is limited by lack of large sample of university female athletes and non-athletes.

# INTRODUCTION

The prevalence of obesity is a major public health concern throughout America (Anderson, 2003). Kuchler (2003) notes that "one reason for the relatively low level of public awareness of the obesity epidemic may be that, while 64% of U.S. adults are estimated to be overweight or obese, only 22% consider their own weight problem as serious." Research indicates that excess weight is linked to disease with long-term health consequences such as coronary heart disease, hypertension, type 2 diabetes mellitus (DM), dyslipidemia, and some cancers (Anderson 2003; Heymsfield, Going, Lohman, & Wang, 2005). Metabolic diseases such as obesity, diabetes, and hypo-or-hyperthyroidism candidly affect the metabolism of fat, carbohydrate, protein, and minerals, which then results in weight gain or loss and changes in body composition (Heyward, 2000). In one study within the U.S., a large sample of 7758 males and 8451 females aged 20 or above, were asked to assess their own (categorical) weight status. The purpose of the study was to cross-tabulate actual weight status (using body mass index) and self-assessed weight status to identify under-assessed or over-assessed weight status. Within this research, Kuchler (2008), examined the misperceptions of individuals' weight status, and found that between genders, women who are a healthy weight or underweight, are more likely than men to think they are overweight. In regard to this topic, another study involving 97 women, revealed that there was a significant difference between measured and reported weight; woman who were categorized as obese were more likely to under-report their weight status (Abdulrahman, 2000). These findings are relevant to researchers who examine how perceptions of weight effect important variables linked to enhancing healthy weight.

More recently, along with the increase of obesity among college students, there

has been additional interest related to the accuracy of perceptions of weight in college students—specifically in females (Desai, 2008). Studies have linked the prevalence of obesity to faulty perceptions of weight appropriateness especially in females (Binkley, 2004; Chang & Christakis, 2003; Pritchard, Kings, & Czajka-Narins, 1997). Weight appropriateness is defined as a perceived measure of weight that is compatible to healthy weight standards. Of interest is that self perception of weight status appropriateness has been reported as a significant factor of dietary and weight management behaviors (Binkley, 2004; Chang & Christakis, 2003; Tiwari & Sankhala, 2007). Research shows that a growing number of female college students perceive themselves as overweight (Anderson, 2003). It is important to note that the college years can have a profound effect in shaping adult behaviors, more specifically the habitual practices of diet and exercise. There are suggestions from previous studies that self-perceived weight status and weight control behavior are strongly linked. Normal weight individuals who relentlessly believe they are overweight are at risk for dangerous behaviors, such as unnecessary dieting or binge eating. Nonetheless, overweight individuals who are in denial about their weight are engaging in risky behavior too by not monitoring their weight and are at risk of becoming obese (Paeratakul, White, Williamson, Ryan, & Bray, 2002). In terms of under-reporting and over-reporting weight status, if college students can more accurately assess their weight status, then the threat of developing chronic health risks can be greatly reduced.

Interestingly enough, that accuracy of college students' perceptions of their weight status has, received limited research attention (Binkley, 2004). It is important to note that individuals' perception of being overweight can yield negative feelings toward their body. In a study composed of two groups of female undergraduate students who did not differ in weight,

dieting attitudes, behaviors, and ideal body type were examined after viewing different types of magazines. Subjects who viewed fashion magazines with tall, thin super models had more negative feelings about their weight than their identical weight counterparts who viewed news magazines (Turner, Hamilton, Jacobs, Angood, & Dwyer, 1997). The results of this study exhibit how influential perceptions are in shaping individuals' views about themselves. Consequently, in a study that examined the differences in perceptions of body shape and body affect in American and Chinese college students, findings revealed that both groups tended to perceive their body shapes accurately. However, the smaller the women perceived themselves to be, the more satisfied they were with their bodies (Chen & Swalm, 1998). These reports were based on how the students felt about their body shape and weight status, not actual measurements.

Today more women participate in sports than at any other period in history. It has been suggested that physical self-perceptions of body weight can have an effect on self-esteem. Young women and girls often report low levels of self-esteem. Participation in sports of any type of physical activity on a regular basis is linked with increases in self-esteem among females. Conversely, studies have found that a decrease in self-esteem plays a role in the development of poorer body image (Milligan, B., & Pritchard, M., 2006). Some studies have suggested that university female athletes have higher physical self-perceptions of weight status than non-athletes. In 2007, the American College of Sports Medicine (ACSM) completed a study that involved 97 university females made up of both athletes (50) and non-athletes (47). Evans and colleagues (2007), hypothesized that university female athletes would have higher physical self-perceptions than females not involved in sports because they scored higher on the

Physical Self-Perception Profile (PSPP) assessment. This PSPP test assessed five different mean differences concerning attractive body, physical condition, physical self-worth, physical strength, and sports competence (Evans, et al., 2007). Results revealed higher scores than non-athletes on all subscale means for the PSPP. Results suggested that participation in sports is positively associated with higher physical self-perceptions among college-aged females. In another study performed by Marsh (1998), adolescent elite athletes were compared to non-athletes in a longitudinal study, which examined age and gender effects in physical self-concepts. Within his study the range for physical self-concept measured nine specific components: (1) appearance, (2) strength, (3) condition/endurance, (4) flexibility, (5) health, (6) coordination, (7) activity, (8) body fat, and (9) sport. Overall, the results of his study was that physical self-concept of elite athletes was higher that non-athletes; however, further analysis between each of the nine components exhibited more information. Of interest is that while female athletes reported higher overall physical self-concept than female non-athletes, older females showed a lower physical self-concept than the younger females in both groups. In addition, the results for physical appearance scale proved to be similar; older female athletes had a lower physical appearance rating than younger female athletes. These results highlight a problem of ongoing low scores on the physical appearance scales for female athletes (Kelly, 2004).

Davis & Cowles (1989) found that female athletes in sports such as gymnastics and long-distance running where a slender body build is the ideal shape reported a more increased level of body dissatisfaction. The “lean sports” are those sports that place an unrealistic ideal value on leanness, including, diving, dance, swimming, gymnastics and distance running (Milligan, et.

al, 2006). The findings support the strong pressures for female athletes to minimize body fat to very low levels. In sports that emphasize leanness, there seems to be a positive correlation between a lean physique and successful performance. Female athletes, along with their coaches, have exercised the assumption that the lower percent body fat or weight, then the more successful her performance ought to be. Unfortunately, this assumption may have a damaging effect on the athlete's self-concept. Self-concept is one's perceptions of oneself that is influenced by behavior and formed through experience with and interpretations of one's environment. For this study in particular, it is important to emphasis the relationship between self-concept and sport involvement. In today's society where much importance is placed on sport involvement—the self-concept of a female adolescent may depend on her success and achievement in athletics (Kelly, L. H, 2004). Marsh and Shavelson (1985), examine the non-academic facet of self-concept that accounts for social, emotional, and physical self-concept. Physical self-concept is separated into the sub-areas of physical ability and physical appearance. Marsh (1998), put physical self-concept in perspective when he noted "physical, self-concept may be influenced by an experimental intervention involving sport, exercise, or a weight loss program, but physical self-concept may also function as a behavioral mediator of the influence of an intervention (e.g. long term exercise program)," (p. 238).

Generally, most people relate physical self-concept to body satisfaction. How individuals perceive their body will be somewhat determined their physical self-concept. Society, environment, and culture all play a role in how an person develops physical self-concept and how it alters throughout the life span.

Obesity is a disorder of energy balance that is characterized by an excess of body fat; clinically a body mass index (BMI) of 30 or higher (Tiwari & Sankhala, 2007). Two essential goals in obesity research for adults and children, involve estimation of total-body fat and fat regional distribution (Davis, 1995). The term obese can simply be described as body fat percent that has reached a level where major health effects can occur. The concept of percent body fat has been frequently used to assess the relationship between body composition and health (Heysfield, 2005). Body composition is a component of physical fitness; from the impact on your health, being over-fat, or having a higher than desirable ratio of fat to muscle, has a demonstrated negative effect on health. Establishing that little to no physical fitness/activity contributes to long-term increases in body fat has enormous potential to enhance our ability to promote intervention or prevention programs for obesity. Clearly measures of body composition and total body fatness change with growing, developing, and aging. Detailed cutoff values exist for children, adolescent, adults, and the elderly exist for this reason and have been acknowledged based on specific health-related standards (Heymfield, 2005). Body composition is the term used to describe the essential components of the body—lean mass, fat mass, and water. These components make up an individuals' body weight. Body weight is divided into fat and fat-free portions. Estimates of body composition typically divide the body into fat and fat-free (water, protein, mineral) components (Davies, 1995). Fat in the body has two major components: essential and storage fat. Essential fat is an element of body structure and is the fat in nervous tissue, bone marrow, cell membranes, and reproductive organs in females (Gibson, 1990). Tritscher defined essential body fat as "the minimal level of fat necessary for maintenance of normal functions of the body" (226). Fat mass is the most

variable element of body composition; it forms less than 10% of body weight in some individuals and more than 50% of body weight in others (Davies, 1995; Heysmfield, 2005). Body fat percentage refers to the percentage of the total body weight that is made up of fat. Though particular attention has been given to body composition, researchers such as Heymfield, verify that “while methods for assessing human body composition give emphasis to the estimation of body fat , techniques to assess muscle mass are limited” (203). Various methods are used for estimating body composition. Although there are several highly developed methods that may be used to gain reference measures of body composition such as neutron activation analysis and magnetic resonance imagery, densitometry (hydrostatic weighing or air displacement plethysmography), dual-energy X-ray absorptiometry (DXA), bioelectrical analysis (BIA), and hydrometry; more commonly used in research settings to estimate body composition (Heyward, 2004). DXA is now the most widely implemented technique used in body composition (Heymsfield, 2005). The DXA instrument functions as two photon beams with different energies to obtain the complete measurement of bone mineral in regions of the body where it is not possible to achieve constant thickness and where soft tissue composition may be inconsistent (Davies, 1995). Some major advantages of absorptiometry is that it is convenient, radiation is low, and is precise and accurate for measuring bone mineral (Davies, 1995). In regard to body composition, the reduction of two energies in a region of soft tissue gives fat and lean masses. DXA is recommended when an accurate estimate of fatness in needed or assessment of fat distribution (Anderson, 2003). Prior to the innovation of DXA, hydrodensitometry was known as the gold standard for body composition assessment methods (Heymsfield, 2005). The major concept behind hydrodensitometry also known as underwater weighing was derived from

Archimedes principal which estimated body volume. Archimedes principal states that a body immersed in a fluid is acted on by a buoyancy force, which is evidenced by a “loss” of weight equal to the weight of displaced fluid (Heymsfield, 2005). Another influential method for measuring body composition is BIA; a rapid, noninvasive technique used to estimate body fat percent that entails little technician skill (Anderson, 2003). Electrical conductivity offers a safe, non-contact method for assessing body composition in humans. The collective ideal for BIA was formerly developed in the United States in 1973, for the It was originally conceived in the USA in 1973 for the swift measurement of the fat and lean proportions of meat packages, carcasses and livestock (Davies, 1995). A weak current electrical current passes through the body via electrodes placed at the hands and feet (Anderson, 2003). A more recent adaptation of the BIA method is the prediction of whole-body composition by assessing impedance in a limb-to-limb electrode layout (Heymsfield, 2005).

Heyward and Wagner (2004) noted that “each of these methods, is subject to measurement error and has basic assumptions that do not always hold true; therefore, none can be singled out as the *gold standard* method for body composition assessment” (19). Several factors such as age, gender, stature, heredity, and pregnancy will influence body composition (Wildman, 2000). Additional anthropometric methods such as BMI, waist-to-hip ratio (WHR), waist circumference, and sagittal abdominal diameter are used to detect individuals at risk for disease (Heyward, 2000). These methods are simple and inexpensive, and do not need superior technician skill and training. Body composition assessment is believed to be a beneficial tool to screen athletes at risk for disorders associated with low body fat, a tool to monitor athletes as they adhere to diet and training programs, and to help athletes set

realistic body weight and body composition goals (Heyward, 2000). However, Heymsfield noted that “there are considerable errors in all body composition measure—even larger in the obese (118).

The effect of body composition on athletic performance is becoming more prevalent. Understanding that with some activities an increase in body weight can decrease performance, many athletes depending on their sport, strive to reduce weight and body fat to enhance athletic performance (Thompson, 1993; Otis, 1997). Performing a body composition assessment typically places the female athlete into one of two categories: moderately lean wanting to be leaner, or moderately to significantly overfat (Berning, 1998). This theory that a relationship exists between body fat and sport performance for many athletes (depending on their sport) is substantial. Essential body fat for females is estimated to be about 12% (Heyward, 2000). Nonetheless, it is important to realize that the exact make-up of this relationship is still not completely understood. If this relationship between weight or body fat loss enhances sport performance then why do below average performances by athletes that are at a low body weight or low body fat composition fail to support this theory? In this scenario, one could conclude that low body weight and body fat composition alone are not the single components that comprise success in sport (Thompson, 1993). It is important to note that many female athletes will weigh more but possess lower percent body fat than sedentary counterparts (Sallis, 1997). The amount of body fat an athlete carries depends on both caloric intake and genetics. Increased pressure from coaches and other individuals within the sport community to lower body weight or body fat percent to unrealistic levels plays a role in the

development of eating disorders (Otis, 1997). Losing too much weight can cause loss of fat-free mass, dehydration, and a decrease in performance (Otis, 1997).

To many coaches, reduced body fat is interpreted as less weight for the athlete to carry and more muscle to utilize (Thompson, 1993). Body fat can be defined as the ratio of body fat to lean tissue (Thompson, 1993). As percent body fat is reduced, there is an increase in the percentage of lean tissue. Similarly, body weight can be defined as the density of fat mass and fat-free mass within the body (Heymsfield et. al., 2005). The loss of body weight is usually a result of losses that not only include body fat but also body fluid, and lean tissue (Thompson, 1993). An individual can appear heavy, be heavy, and still have low body fat. While weight loss usually involves muscle and body fat loss, and weight gain an increase in both where is more to the amount of muscle. Studies have shown that if weight loss is involved in this process and body fat is lost, the percentage of muscle mass increases, but the absolute amount of muscle overall decreases because of loss of lean tissue (Thompson, 1993). Ideal body weight is a term that represents recommended weight based on height, body frame, and gender, and is often stated as a certain weight range based on general health standard (Thompson, 1993). Clearly, the ideal percent body fat for each individual is vague (Berning, 1998).

## METHODS

Fifty members of university female athletes (25) and non-athletes (25) between the ages 18 to 24, were participants in this study. There was a random selection of both female athletes and non-athletes. The NCAA Division II sport teams being represented were track & field, volleyball, soccer, softball, and basketball. The non-athletes were randomly selected from the same university. All students were currently enrolled at the university and participation by

the students was completely voluntary and confidential; the athletes were randomly selected using Graphpad Software, Inc. Prior to initiating the study, the Institutional Review Board approved all procedures. Subjects worked in a controlled environment in a university health lab. An informed consent form was administered by the researcher to participants prior to their completing the self-perception questionnaire (see Appendix B). After assessing body composition, participants completed a health questionnaire during the assessment. A physical self-perception questionnaire was used for this study. The self-perception question was extracted from the third National Health and Nutrition Examination Survey, 1988-94 (NHANES III), which measured self-perceived body weight status. Participants were asked to assess their own weight status: 'Do you consider yourself now to be overweight, underweight, or about the right weight" (Kennedy, et al., 1994)? After reading the question, participants were expected to circle one of the three categories: overweight, underweight, or about the right weight (Chang, & Christakis, (2003). (see Appendix A). The question was constructed to allow participants to circle the classification in which they perceived themselves to be; weight status was self-reported as either "underweight", "overweight", or "about the right weight". Once the students completed the questionnaire, it was then placed in an envelope. This prevented students from changing their weight status as a result of percent body fat measurements.

Upon the completion of questionnaire, the participants' height and weight of the subjects were taken using standard procedures. All weight measurements were taken using a weight scale. All height measurements were taken using a stadiometer. Height and weight was entered into the hand-held Omron® instrument for body fat analysis, in addition to age, gender, and sport type. Individual body fat percentage was determined through bioelectrical

impedance analysis method (BIA). This BIA method was performed using the hand-held Omron® Fat Loss Monitor. After calculating body fat percent, students were assigned recommended body fat ranges based on their percent. This was considered their actual body composition. Actual body fat measures were classified using the recommended body fat ranges for ages 20-39 as cited in the American Journal of Clinical Nutrition (Gallagher, Heymsfield, Heo, Jebb, Murgatroyd, & Sakamoto, 2000) (see Appendix C). Percent body fat was classified as follows: 5-20% low (underweight), 21-33% good (right weight), and 34-38% high (overweight), and >38 very high (obese).

Following the assessment, statistical analyses were performed to interpret the data. The statistical analyses used in this study was the Independent T-test, a descriptive statistic used to organize and describe the differences between sampling means, and the Spearman's rho Test along with the Pearson's Chi-Square Test that are nonparametric tests used to analyze data in categories and by ranks. To determine differences between actual and perceived percent body fat an independent T-test was performed for female athletes and non-athletes. A nonparametric correlation known as Spearman's rho test was used to compute the relationship between ordinal data; correlation between actual and perceived weight status was run. The Chi-Square test, an analysis used to test for independence, acts as a sampling distribution that gives probabilities about frequencies.

## RESULTS

An independent T-test was used to test the first hypothesis that proposed female athletes will have lower levels of percent body fat than non-athletes. Results showed that

there was a significant difference in percent body fat scores between female athletes and non-athletes ($t$ (48) = 2.97, $p < .05$). This suggests that University female athletes had lower levels of percent body fat than their counterparts (see Figure 1).

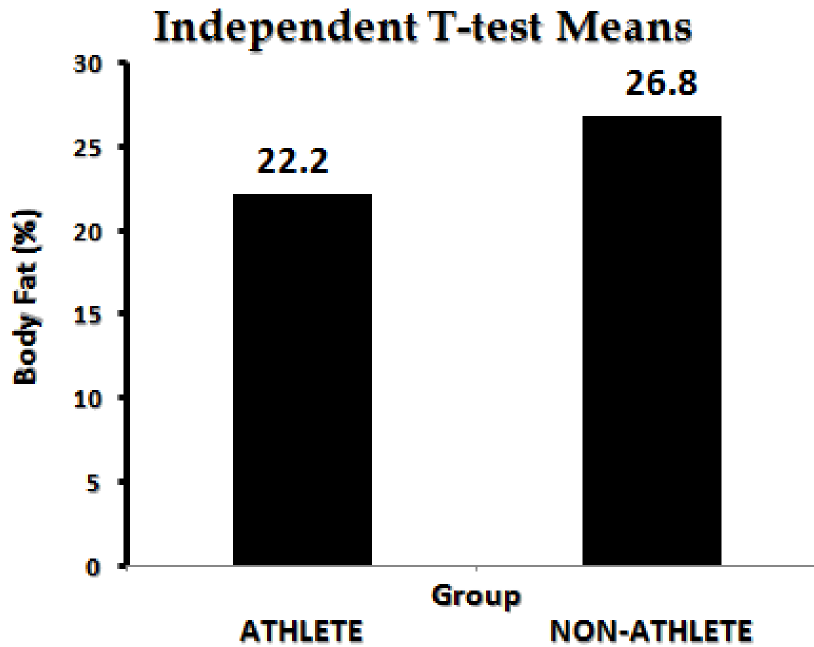



Figure 1. *Means of body fat percent in female athletes and non-athletes*

A second independent T-test was used to test the third hypothesis that stated Female athletes will report classifications of self-perception of weight status with greater accuracy than non-athletes. Results showed that there was no significant difference in self-perception of weight status scores between female athletes and non-athletes ($t$ (48) = -.58, $p > .05$).

Table 1

*Percent Body Fat & Self-Perception of Weight Status*

| | Athletes | | Non-Athletes | |
|---|---|---|---|---|
| Variables | M | SD | M | SD |
| Apbf | 22.24 | 4.34 | 26.82 | 6.38 |

| Spws | 2.40 | .50 | 2.34 | .48 |
|---|---|---|---|---|

*Note.*
Apbf = Actual Percent Body Fat
Spws = Self-Perception of Weight Status

Results of the participants' actual percent body fat and perceived weight status means and standard deviations are presented in Table 1. Perceived weight status was determined by participants indicating whether they felt underweight (1), about the right weight (2), or overweight (3).

Spearman's rho Test was implemented to measure the linear relationship between the two groups (athletes/non-athletes). The second hypothesis proposed a positive correlation between physical self-perception of weight status and actual measures of body composition. Spearman's rho correlation revealed a significant difference between physical self-perceptions of weight status and actual measures of body composition (r = .57), verifying the second hypothesis.

The fourth and final hypothesis postulated a strong correlation between self-perception of weight status and percent body fat among collegiate female athletes. A 2x2 Pearson Chi Square analysis was performed to examine distribution frequencies of actual and perceived weight status scores between group types (athlete/non-athlete) (see Table 2). As hypothesized, the Chi Square revealed that there was a significant difference, ($X^2$ (2, N=50) = 6.696, $p < .035$). A second 2x2 Pearson Chi-Square analysis was performed to examine the difference in self-perception of weight status frequencies between group types. The Chi-Square revealed that there was no significant difference, ($X^2$ (2, N=50) = .347, $p > .556$). A final 2x2

Pearson Chi-Square test was performed to examine the distribution frequencies between physical self-perception of weight status and actual measures of percent body fat that involved all participants that took part in this study (N = 50). As hypothesized the Chi-Square test revealed that there was a significant difference in frequencies, ($X^2$ (2, N=50) = 12.468, $p < .002$).

Table 2

*Chi-Squared by Group-type*

Athletes

| | | Perceived Weight Status | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | Total count |
| Actual | 1 | 0 | 9 | 1 | 10 |
| Weight | 2 | 0 | 6 | 9 | 15 |
| Status | 3 | 0 | 0 | 0 | 0 |
| Total count | | 0 | 15 | 10 | 25 |

Nonathletes

| | | Perceived Weight Status | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | Total count |
| Actual | 1 | 0 | 4 | 0 | 4 |
| Weight | 2 | 0 | 13 | 4 | 17 |
| Status | 3 | 0 | 0 | 4 | 4 |
| Total Count | | 0 | 17 | 8 | 25 |

Note.
1=Underweight
2=Right weight
3=Overweight

Both Groups

| | | Perceived Weight Status | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | Total count |
| Actual | 1 | 0 | 13 | 1 | 14 |

| | | | | | |
|---|---|---|---|---|---|
| Weight | 2 | 0 | 19 | 13 | 32 |
| Status | 3 | 0 | 0 | 4 | 4 |
| Total count | | 0 | 32 | 18 | 50 |

Note.
1=Underweight
2=Right weight
3=Overweight

Of interest is that the Chi-Square crosstabulations between body fat status and sport type revealed a considerable percentage of cells (2 cells) with expected values less than 5 (33.3%) for overweight category, indicating that the results did not interpret a chi-square distribution very well in the overweight category. Similarly, the Chi-Square crosstabulation between body fat status and weight Status revealed a considerable percentage of cells with expected values less than 5 (33.3%) in the overweight category. These results are represented in Table 3.

Table 3

*Chi-Square summary of Crosstabs*

**Body Fat Status * Sport Type Crosstabulation**

| | | | Sport Type | | |
|---|---|---|---|---|---|
| | | | Athlete | Non-Athlete | Total |
| **Body Fat Status** | Underweight | Count | 10 | 4 | 14 |
| | | Expected Count | 7.0 | 7.0 | 14.0 |
| | Right weight | Count | 15 | 17 | 32 |
| | | Expected Count | 16.0 | 16.0 | 32.0 |
| | Overweight | Count | 0 | 4 | 4 |
| | | Expected Count | 2.0 | 2.0 | 4.0 |
| | Total | Count | 25 | 25 | 50 |
| | | Expected Count | 25.0 | 25.0 | 50.0 |

**2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.00*

**Weight Status * Sport Type Crosstabulation**

| | | | Sport Type | | |
|---|---|---|---|---|---|
| | | | Athlete | Non-Athlete | Total |
| Weight Status | Right weight | Count | 15 | 17 | 32 |
| | | Expected Count | 16.0 | 16.0 | 32.0 |
| | Over weight | Count | 10 | 8 | 18 |
| | | Expected Count | 9.0 | 9.0 | 18.0 |
| | Total | Count | 25 | 25 | 50 |
| | | Expected Count | 25.0 | 25.0 | 50.0 |

**Weight Status * Body Fat Status Crosstabulation**

| | | | Body Fat Status | | | |
|---|---|---|---|---|---|---|
| | | | Underweight | Right weight | Overweight | Total |
| Weight Status | Right weight | Count | 13 | 19 | 0 | 32 |
| | | Expected Count | 9.0 | 20.5 | 2.6 | 32.0 |
| | Overweight | Count | 1 | 13 | 4 | 18 |
| | | Expected Count | 5.0 | 11.5 | 1.4 | 18.0 |
| | Total | Count | 14 | 32 | 4 | 50 |
| | | Expected Count | 14.0 | 32.0 | 4.0 | 50.0 |

**2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.44.*

In terms of over-assessing their weight status, approximately half (54%) of females classified as healthy weight or underweight, reported themselves as overweight. In summary, 46% of the females were accurate in reporting their weight status, while 54% overestimated and 0% underestimated their weight status.

Of interest is that actual percent body fat measures and self-perceptions of weight status was different for both groups (see Figure 2). Important to note is that the chi-square test for athletes, revealed that 40% were underweight, but all underweight athletes placed

themselves into the right and overweight category. In addition, while 60% of the females athletes that were healthy weight (right weight), only 40% place themselves into the right weight category. Important to note is that there were no female athletes with percent body fat ranges in the overweight category. Of interest is that the chi-square test for non-athletes revealed that 68% of the female non-athletes that were healthy weight (right weight), about 77% place themselves into the right weight category. Based on self-perception of weight status, the observed count of the underweight category for both groups was nonexistent; neither athletes nor non-athletes perceived themselves to be underweight. Overall, 66% of the female subjects were healthy weight (right weight) and only 8% were overweight.

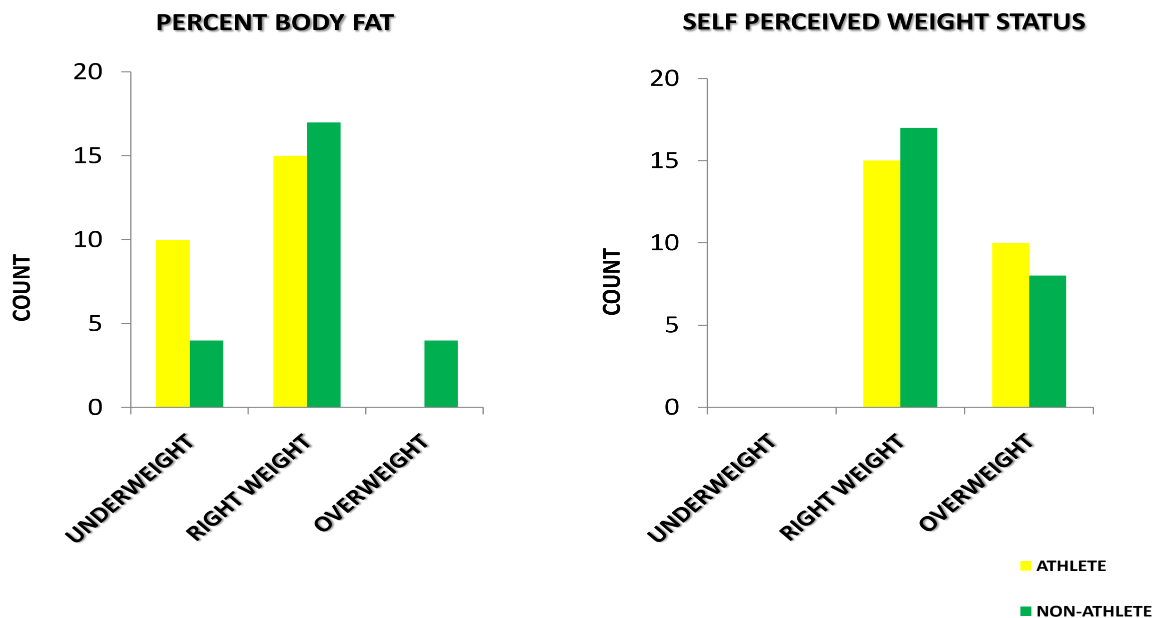



Figure 2. *Chi-Square data charts of observed frequency count of subjects.*

DISCUSSION

The purpose of this study was to examine the accuracy of college student's physical self-perception of weight status classification and the relationship between students' self-

perceptions of weight status to their actual measures of percent body fat. More specifically, the purpose of this study was to compare the accuracy of female college athletes and non-athletes self-perceived classification of their weight status. A second purpose in this study was to determine if female college athletes will exhibit lower levels of body fat percent than non-athletes. Of interest was the positive correlation between actual measures of body composition and physical self-perception of weight status found for female college students. These results enhance the likelihood for further studies to be performed when comparing these two variables.

Individuals' misclassification of their weight status can have many health implications. Approximately 54% of the college students from this sample size had faulty perceptions of weight appropriateness. Of interest is that 54% of females classified as health weight or underweight, overestimated their weight status, while none classified as overweight, underestimated their weight status. Consequently, by assuming there are of right weight (healthy weight), those students may be unaware that they could be susceptible to weight related diseases and health problems such as cardiovascular disease, Type-II diabetes, hypertension, and high blood cholesterol levels. Additionally, cancer can also be more prevalent in the obese population than for the normal weight population. Binkley (2004) noted that obese females die more often than lighter weight females from cancer of the uterus, breast, ovaries, and gallbladder (p 18).

The results indicate that there is a significant difference in actual body fat percent measures between female college athletes and non-athletes. The findings of this study indicate that individuals involved in daily aerobic activity have lower levels of body fat percentage and

have an advantage over individuals not involved in a sport or physical activity. Today more women participate in sports than at any other period in history. The number of female collegiate athletes has increased from almost 32,000 in 1971 to over 150,000 in 2000; an increase of more than 500% (Reinking & Alexander, 2005). This increase in participation by women in collegiate sports has resulted in a heightened awareness of body and behavioral responses in women in athletic activity. Researchers have revealed that women have essential benefits from exercise, including lower risks for hypertension, obesity, type II diabetes, and cardiovascular disease (Reinking & Alexander, 2005).

Athletes are constantly engaging in exercise in a never ending feat to optimize their performance and physical condition. The less fat mass within the body, than the greater chance that they body can keep up with all the physiological demands. However, it should be noted that the female body needs 8-12% of essential body fat to be able to perform normal physiological functions. Body composition, which is based on the relationship of lean mass to fat mass, is an important component of overall health. The distinction between being overweight and over-fat is essential. Psychologically, when individuals are self assessing their weight status, it is difficult to differentiate between lean muscle mass and fat.

Many young women are driven to extreme measures to succeed at their sport or achieve the ideal lean athletic image; all this is done without the consideration of potential health risks for women (Berning & Steen, 1998). Clearly, the athlete may be motivated to engage in lowering body weight such as diet restriction or disordered eating behaviors. In addition, this could lead to negative physical as well as psychological outcomes for the athlete. Thompson (1993) noted that many of the traits that are characteristics of individuals with

eating disorders are also the traits found in good or elite athletes. Some of these traits include individuals who work hard, overachieve in multiple areas, perfectionists, withstand pain, persevere through hardships, expect high achievement and optimal performance, and are usually very coachable. Several studies have shown that athletes involved in thinness-demand sports are more likely to fall prey to eating disorders (Thompson, 1993). Eating disorders can be found in female athletes in all sports, but not necessarily equal in all sports. A survey composed by NCAA in 1991 found that gymnasts, cross-country, and track were the sports' most often reported as having at least one athlete with an eating disorder (Hurly, 2001). The rationale for this is that thinness-demand sports draw athletes who either already have an eating disorder or are at risk for developing an eating disorder (Thompson, 1993). Because sports that emphasize thinness seem to show higher prevalence rates of eating disorders among participants than those without that emphasis, we can assume that thinness demand sports play a huge role in the connection between sport and eating disorders.

One might venture to inquire if athletes have a higher occurrence of eating disorders than non-athletes? Clearly athletes with eating disorders are probably more similar than dissimilar to their non-athlete counterpart. On the contrary, others have found a lower occurrence of eating disorders in athletes that are similar to rates found in the general population (non-athletes) (Thompson, 1993). However, Pasman and Thompson (1988) discovered minimal to no differences when comparing rates of eating disorders in athletes to those in non-athletes. In addition, Owens and Slade (1987) reported only minimal similarities between to athletes and eating disordered patients (Thompson, 1993).

Perhaps a more prevalent finding highlighting various complexities involving collegiate female athletes would be American College of Sports Medicine's (ACSM) Position Stand on the Female Athlete Triad. It is important to note that the Position Stand on the Female Athlete Triad was the focal point of a consensus conference called by the Task Force on Women's Issues of the ACSM in 1992. ACSM distinguishes the Female Athlete Triad as a serious syndrome occurring not only in elite athletes but also in physically active girls and women. The syndrome consists of disordered eating, amenorrhea, and osteoporosis (Otis, Drinkwater, Johnson, Loucks, & Wilmore, 1997). While these 3 conditions are thought to be distinctive diagnostic components, they are intricately related to each other and combine to influence the health of female athletes (Reinking & Alexander, 2000). However, Reinking and Alexander (2000) note that disordered eating may be central to the development of the triad. Furthermore, the Female Athlete Triad has been quoted by Ireland and Nattiv (2002) as "One of primary medical concern; the problems of the female athlete triad collectively, as well as its individual components, have since been recognized as potentially serious problems for girls and women in sport worldwide (p. 223).

Similar to issues mentioned above, the ideal that females can achieve or maintain unrealistically low body weight is the prime trigger for the development of these disorders. The Female Athlete Triad can be described as a desire to maintain a socially acceptable physique (Berning & Steen, 1998). Physique refers to the composition of the entire body as opposed to emphasis on certain features. Most girls and women are trying to achieve unrealistic thinness because they are succumbing to unrealistic societal pressures to be thin and peer pressure. Clearly, there is an increasing awareness of the influence of body composition on athletic

performance. More specifically for female athletes, there are additional factors within the sport environment that put them at risk for being tagged with the Triad. Thompson and Sherman (1993) recognized that because athletes often wear revealing uniforms (especially in thinness demand sports; i.e.: gymnastics) and frequently shower and change clothes together, it is easy for them to make critical comparisons of body sizes, shapes, and weight—which then allows the female athlete to see what she needs to see to justify her need to be thin. While an increase in body weight can affect performance is some cases, feeling the need to decrease body weight of body fat percentage to unrealistic levels can factor into the development of disordered eating practices (Otis et al., 1997).

Perhaps a more prevalent finding highlighting various complexities involving female athletes that derive from one of the three components of the Triad is ACSM's position stand on disordered eating. ACSM's defines restrictive eating behaviors as "inadvertently failing to balance energy expenditures with adequate energy intake, episodic fasting, and chronic voluntary starvation" (Otis et al., 1997, p. 1670). In addition, serious caloric restriction lessens metabolic rate and causes changes in the musculoskeletal, cardiovascular, endocrine, thermoregulatory, and other systems (Striegal-Moore & Smolak, 2001). A number of factors contributing to the development of disordered eating and the fall of the Female Athlete Triad include pressure from others, especially coaches, and the athlete's obsession to reach a certain target body weight or body fat percent (Sundgot-Borgen, 1999). The wide range of disordered eating practices includes fasting, diet pills, laxatives, diuretics, and vomiting. These disordered eating practices along with caloric restriction combined with excessive bouts of exercise in order to lose weight, have negative effects on athletes' performance and mental perception,

which can cause chronic health problems (Hurley, 2001). Clearly, these weight control methods are risky, and weaken sport performance; they result in starvation (muscle loss) and dehydration rather than the desired loss of body fat (Sallis &Massamino, 1997). For both athletes and nonathletes, eating disorders unfold a series of medical problems and can even be fatal. Research shows that female athletes are at a greater risk of developing eating disorders than nonathletes (Sundgot-Borgen, 1999). Smolak and colleagues (2000) support this finding in their meta-analysis of 34 studies assessing disordered eating in female athletes (2459 athletes and 8858 controls), discovered that female athletes are at higher risk for disordered eating compared to nonathletes. More specifically, elite athletes are at increased risk especially in sports emphasizing thinness (Ireland & Nattiv, 2002). Furthermore, limited studies have shown a prevalence of eating disorders of 15% to 62% in female athletes (Sallis & Massamilio, 1997).

ACSM (1997) defines restrictive eating behaviors as “inadvertently failing to balance energy expenditures with adequate energy intake, episodic fasting, and chronic voluntary starvation.” In addition, serious caloric restriction lessens metabolic rate and causes changes in the musculoskeletal, cardiovascular, endocrine, thermoregulatory, and other systems (Otis, et al., 1997). The wide range of disordered eating practices includes fasting, diet pills, laxatives, diuretics, and vomiting. These disordered eating practices along with caloric restriction combined with excessive bouts of exercise in order to lose weight, have negative effects on athletes’ performance and mental acuity, which can cause chronic health problems (Hurley, 2001). For both athletes and non-athletes, eating disorders unfold a series of medical problems and can even be fatal. More importantly, female athletes are at a greater risk of developing eating disorders than nonathletes (Sundgot-Borgen, 1994). At the severe end of the

continuum of disordered eating practices are anorexia nervosa and bulimia nervosa disorder. A number of factors contributing to the development of disordered eating and the fall of the female athlete triad include pressure from others, especially coaches, and the athlete's obsession to reach a certain target body weight or body fat percent (Sundgot-Borgen, 1994).

Smolak and colleagues, in a meta-analysis of 34 studies assessing disordered eating in female athletes (2459 athletes and 8858 controls), discovered that female athletes are at higher risk for disordered eating compared to nonathletes, and that elite athletes are at increased risk especially in sports that emphasizing thinness (Ireland, 2002). In addition, athletes score higher on the Drive for Thinness (DFT) subscale of the EDI or EDI-2 compared to nonathlete controls.

Much attention has been drawn to athletes engaging in disordered eating behaviors. Disordered eating refers to the range of abnormal eating behaviors that may not necessarily fit the DSM-IV criteria for eating disorders (Ireland & Nattiv, 2002). Research conducted by Thompson and Sherman (1993) note that many of the traits that are characteristic of individuals with eating disorders are also the traits found in good or elite athletes. Some of these traits include individuals who work hard, overachieve in multiple areas, withstand pain, persevere through hardships, expect high achievement and optimal performance, and are usually very coachable. In addition, several studies have shown that athletes involved in thinness-demand sports are more likely to fall prey to eating disorders (Thompson & Sherman, 1993). It is important to note that eating disorders can be found in female athletes in all sports, but not necessarily equal in all sports. A survey composed by NCAA in 1991 found that gymnasts, cross-country, and track were the sports' most often reported as having at least one athlete with an eating disorder (Hurly, 2001). Because sports that emphasize thinness seem to

show higher prevalence rates of eating disorders among participants than those without thinness emphasis, we can assume that thinness demand sports play a huge role in the connection between sport and eating disorders.

Eating disorders are more than an emotional and psychological problem. At the severe end of the continuum of disordered eating practices are anorexia nervosa and bulimia nervosa disorder. Eating disorders such as anorexia nervosa and bulimia are depicted as diseases of young, middle class, white woman (Berry & Howe, 2000). The presence of an eating disorder in an athlete is not always easy to determine; it can be hidden easily. For instance, thinness-demand sports like gymnastics and cross country provide an alternative defense for adhering to thinness or smallness requirements because gymnasts and distance runners are supposed to be thin (Thompson & Sherman, 1993). Clearly, aspects of specific sports attract individuals who are either eating disordered or at risk for the development of an eating disorder. Thompson and Sherman (1993) theorize that participation in a specific sport causes eating disorders; however sport does not cause the disorder but can lead to its development in athletes who are susceptible to having a disorder. Anorexia nervosa is beyond restrictive eating behavior wherein the individual perceives herself as overweight and is fearful of gaining weight regardless of the fact that she is 15% below ideal body weight (Otis, et. al., 1997). The DSM-IV defines anorexia nervosa as the “refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight <85% of that expected; failure to make expected weight gain during period of growth, leading to body weight , 85% of that expected” (Striegal-Moore & Smolak, 2001, p. 321). The two specific types of anorexia nervosa is restricting type and binge-eating type/purging type.

The athlete with anorexia nervosa, like the nonathlete, is known to exercise excessively, compulsively, and as a form of purgation. Both the athlete and nonathlete may experience feelings of guilt, anxiety, depression, and overweight when unable to exercise. From a psychological standpoint, Thompson and colleague note:

> The nonathlete with anorexia nervosa needs to be thin. Often she cannot be specific about how thinness will benefit her, but she in nonetheless convinced that it will make her happier. The athlete has the same general need but also strives to be thin to realize her athletic goals (p. 73).

However, a female athlete is more apt to believe she is losing a major part of her identity when she is not able to exercise or train and compete (Thompson & Sherman, 1993). Athletes who are anorexic often have a strong desire to please others to gain approval. They seem to have no problem pushing themselves to extreme levels in sports even when they are exhausted; pain and discomfort can be tolerated. The physical symptoms of athletes with anorexia nervosa are amenorrhea (lack of menstrual cycle), dehydration, and fatigue (beyond normally expected with training). Anorexia nervosa is distinguished by the refusal to sustain a normal body weight (Hurley, 2001). Interestingly enough, some athletes with anorexia are extremely successful in their sport during the beginning stages of their disorder; however, before long the athlete's performance is in jeopardy due to the effects of malnutrition (Thompson & Sherman, 1993). Thus malnutrition causes the muscle in the heart to atrophy which in turn taxes the heart (Hurley, 2001). One of the biggest consequences for female athletes with anorexia nervosa is the cessation of menstrual periods. When a women stops having menstrual cycles, she is not getting enough estrogen, which will cause bone reduction

after a six month period which can lead to osteoporosis (Hurley, 2001). Treatment of menstrual disorders has been targeting by participating in Estrogen Replacement Therapy, which involves a form of therapy with estrogen hormones most commonly used to treat the symptoms of menopause (Berning & Steen, 1998). Thompson and Sherman (1993), note "the combination of amenorrhea and low body weight that is characteristic of anorexia nervosa appears to place the female athlete at greater risk for skeletal injuries such as stress fractures (p 80). Despite treatment and a return to normal weight, amenorrhea may persist up to 10% to 30% of recovered anorexics.

Bulimic behavior is a continual cycle of fasting or food restriction that leads to overeating or binging that results in purging (Otis, et al., 1997). The DSM-IV defines a binge as "eating in a discrete period of time (e.g. within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances" (Striegal-Moore & Smolak, 2001, p. 328). The signs for purging behavior include the use of laxatives, diuretics, enemas, vomiting, and excessive exercise. An individual with bulimia nervosa may be underweight, but normally not as underweight as the anorexic (Thompson & Sherman, 1993). Most athletes suffering from bulimia nervosa are at or close to normal weight (Ireland & Nattiv, 2002). Ironically, young women with bulimia tend to be attractive, high achieving, and very high functioning; unfortunately they are unable to perceive themselves as such. Female athletes with bulimia nervosa tend to be very coachable, extremely compliant and cooperative, and deeply loyal to team and coach. Of interest is that a number of nonathletes with bulimia nervosa do not participate in any form of exercise activity, much less excessive exercise. In order to control difficult emotions such as depression and anxiety, a

bulimic person participates in bingeing and purging. The bulimic person habitually regards the bingeing rituals that she does before purging as eating. While many bulimic's demonstrate a low tolerance for anxiety and frustration, their behavior is regularly impulsive and careless.

While most female athletes will not possess definite anorexia or bulimia, many possess a major clinical adaptation with their body size or shape or an eating disorder that is not otherwise specified (NOS) (Ireland & Nattiv, 2002). DSM-IV criteria for an eating disorder that is NOS, characterizes individuals with clinically significant disordered eating attitudes and behaviors that would not meet full diagnostic criteria for anorexia nervosa or bulimia nervosa (Striegal-Moore & Smolak, 2001). NOS is a less severe syndrome that is more common for patients diagnosed with disordered eating; about 25%-50% are NOS.

Within the spectrum of the female athlete triad, there are two more components still open for discussion: amenorrhea and osteoporosis. Amenorrhea is the most identifiable symptom of the Female Athlete Triad (Otis, et al., 1997). Amenorrhea has been defined as the lack of a regular menstrual period and maybe classified as primary or secondary (Berning & Steen, 1998). First included in the DSM-III-R, amenorrhea was thought to endow evidence of an endocrine disorder. It is important to note that amenorrhea may or may not be associated with an eating disorder; its critical factor is low energy intake rather than low weight. Female athletes who participate in frequent, excessive exercise may have normal weight and body fat levels but burn too many calories because of it, and as a result are not able to maintain menstrual periods (Thompson & Sherman, 1993). Moreover, amenorrhea, it is argued, "distinguishes anorexia nervosa from normal low weight because it signifies hypothalamic dysfunction and alerts clinicians to possible sequelae such as osteoporosis and infertility.

Thus…. “amenorrhea is a diagnostic criterion and a sign of medical morbidity for anorexia nervosa” (Streigal-Moore & Smolak, 2001, p. 34). Primary amenorrhea is lack of menstruation by age 14 with absence of secondary sex characteristics or lack or menstruation by age 16 with secondary sex characteristics present (Berning & Steen, 1998; Sallis & Massamino, 1997). Secondary amenorrhea is absence of menstruation for 3 months if previous menses were regular or for 6 months if previous menses were irregular; pregnancy excluded. Secondary amenorrhea has also been referred as exercise-associated amenorrhea (EAA). Women participating in any type of sport are being diagnosed with exercise-associated amenorrhea. Sallis and Massamino (1997) detected its prevalence by noting that 3% to 66% of athletes have EAA, compared to 2% to 5% of normal population with EAA. Studies have reported that the range of athletic women who experience amenorrhea is between 1% and 44% at any given time (Otis, et al., 1997). The cause for amenorrhea has been defined by Otis and colleagues (1997) as “. . . a reduction in the frequency of luteinizing hormone pulses from the pituitary gland and subsequent ovarian suppression in physically active women” (p. 1670). Reversal of amenorrhea and ovulation are difficult to predict in amenorrheic women; however, reversal of amenorrhea has been reported after injury, weight gain, during less intense training, and with an increased caloric intake (Otis, et al., 1997).

In 1991, the National Osteoporosis Foundation reported that over 25 million women in the United States were affected by osteoporosis and 75 million people worldwide (Sallis & Massamino, 1997). Osteoporosis refers to reduced bone mass and increased rates of bone loss. Normal bone mineral density (BMD) is described as 1 standard deviation (STD) below the mean, while severe osteoporosis is a BMD greater than 2.5 STD’s below the mean and one or more

fractures. Of interest is that the World Health Organization has determined diagnostic criteria for postmenopausal osteoporosis using bone density measurements; however, there is a lack of comparable diagnostic criteria for girls or young women using bone density criterion (Ireland & Nattiv, 2002). Bone loss has the potential to intensify with the occurrence of disordered eating practice and low calcium intake in combination with menstrual irregularities (Otis, et al., 1997). However, not all amenorrheic athletes have low bone mass. There is concern for female athletes with low BMD due to risk for fractures during competitive years in addition to the risk of premature osteoporosis (osteopenia) fractures which include hip, wrist, stress fractures, and vertebrae. Nonetheless, emphasis of newer technique for measuring bone density is being used in one particular assessment, which includes dual energy x-ray absorptiometry (DXA); an instrument that can assess deteriorating bone mass and monitor it. Research has shown that Amenorrheic female athletes involved with hormone replacement therapy using doses similar to those used in menopausal women, have reported maintenance of bone mineral density (Otis, et al., 1997).

It should be noted that the majority of girls and women benefit greatly from participation in sports and exercise. There is indefinitely a positive energy balance that should be maintained in order to avoid any of the three components of the female athlete triad. Although the exact prevalence of the triad is not fully known, all female athletes should be assessed to examine the risk for triad disorders. Clearly, ongoing attention to disordered eating behaviors in collegiate athletes is needed. Thompson and Sherman (1993) suggest that though it is easy for a female athlete to hide their disorder, it is far from easy for people around the athlete to identify a problem, which in turn makes it difficult for the affected athlete to realize

the need for intervention. The seriousness of this problem is significant because without intervention, the affected athlete might delay treatment for an eating disorder which means their physical health and emotional well-being could be severely compromised.

It is important to realize that each component of the triad disorders—disordered eating, amenorrhea, and osteoporosis—occurs on a scale. Early detection is essential for prevention and treatment of disorders. The dilemma of the triad draws attention to the possibility for more severe disorders along the scale (Ireland & Nattiv, 2002). In order to obtain a more complete understanding of the female athlete triad, there is need for prolonged dedication to research in order that etiology, pathogenesis, screening technique, and therapy to be documented (Sallis & Massamino, 1997). Prevention of the female athlete triad is imperative, such as screening for the triad which might include screening for depression, weight fluctuations, cardiac symptoms, dehydration levels, and stress fractures—early recognition or warning signs. Athletic departments in universities should be more aware of the three components of the Female Athlete Triad. In addition, Berry and Howe (2000) recommend that additional research must be achieved to explore the role of coaches and peers in the development of disordered eating. Moreover, advocate health and a more realistic body image for young, active women.

The results from this study draw attention to the psychological component of physical self-perceptions of weight status. The self-perception questionnaire used in this study (NHANES III), (see Appendix B) revealed that female non-athletes that were classified as healthy (right weight)weight status had a much healthier self-perception of their body composition

than the athletes. This contradicts the previously mentioned study by ACSM that University female athletes have higher physical self-perceptions than female not involved in sports (Evans, et. al., 2007). Although athletes are at a major advantage in the domain of "sport competence, physical strength, physical condition, and an attractive body," (Karteroliotis, 2008) they tend to extremely hard on themselves psychologically. Moreover, female athletes struggle with perfectionism and as a result are caught up in a sometimes never ending cycle of dissatisfaction. Based on these assumptions, it makes sense that the female athletes participating in this study over-reported their weight status, which shows that they are dissatisfied with their weight status.

It is important to note the possible limitations within the perimeters of this study. One particular limitation was the small subject pool by lack of large sample of collegiate female athletes and non-athletes limit the statistical power of the findings. Another limitation was the fluctuations in body fat percentage over-and-under hydration levels while using the Omron. An individual needs to wait 1 to 2 hours after consuming food or drinking fluids. In addition the physical self-perception questionnaire (Appendix A) could be judged as being too broad. In order to counteract this limitation, the nine figure silhouette scale would be more effective at assessing physical self-perceptions concerning weight status (Appendix E). Further research could be quantified by involving more participants and both genders. Interestingly enough, by correlating between the different sports involved in the study and comparing the self-perception of the different ages, this study conjecture new results and strengthen the present components within the study.

CONCLUSION

Research examining the physical self-perception of weight status and the critical values that influence it is important field of study. Of interest is that researchers have examined faulty self-perceptions of weight status as one probable cause for the unhealthy weight trend that leads to obesity. It has been suggested that the self-perception of weight status strongly influences an individuals' dietary and weight management behaviors. If individuals are going to engage in healthy and active lifestyles, then the need for and development of positive perceptions of their weight status is essential to their overall well-being. Moreover, the prevalence of obesity should further motivate Americans to engage in healthier dietary and weight management behaviors. Overweight college students are at risk for significant illness and premature death.

Researchers have confirmed that women have increased benefits from exercise, including decreased risks for hypertension, obesity, and type II diabetes mellitus (Milligan, et al., 2006; Evans, et al., 1997). It must also be acknowledged that women who compete in any form of organized sports are at lower risk for substance abuse, depression, teen pregnancy, and have a more positive self-image. The results of this study could provide further evidence that female athletes who are involved in sports or physical activity on a daily basis will perceive body weight closer to actual measures. Consequently, it could be suggested that female athletes will be better able to perceive their body weight in proportion to actual measures of body fat percent.

Accuracy in judging body composition and weight status is an important prospect of research because individuals need to know their specific percent body fat measurements as well as how these measurements convert to an actual weight status (e.g. underweight, normal

weight, overweight, obese). Clearly, individuals need to be educated about the implications of their weight on good health standards or indicators.

In addition, the relationship between physical self-perception of weight status to their body composition is important to comprehend. The reality is that people with unhealthy self-perceptions of their weight status are less likely to participate in physical activity with age. It is important to note height and weight are both frequently used in clinical health settings to assess and determine the health status of an individual. If height and weight measurements are going to be used for determining body composition, it would be right to explore how female perceive body fatness.

To conclude, results from this study suggest that a significant portion (within this small sample size) of university female students fell into the at-risk weight categories. It is important to realize that people who are in higher weight categories be informed of potential health risks and available resources to modify poor weight management behavior. Lastly, additional research must be conducted to improve the development of healthy perceptions of weight status, specifically in educational systems across the United States.

Some limitations involved within the perimeters of this study include the small sample (n=50) of university female students which limits the statistical power of the findings. In addition, sample variability could enhance the study by involving both genders. Also, an additional statistical analysis could be performed between the different sports involved in the study. Another concern relates to the subjects' honesty. Most female athletes desire to have an ideal body, but most are unable to admit that they lack that ideal body. Future research in this study should include greater variety sampling distributions from other universities. Another area that could be addressed in this study is a correlation between percent body fat

and age and self-perception of weight status and age. Furthermore, the Dual Energy X-Ray Absorptiometry (DEXA) instrument could be used to estimate total body composition as a substitute for the BIA instrument. Additional surveys such as Physical Self Perception Profile (Fox, 1990) and the 9-Figure Silhoutte Scale (Stunkard, 1983) (see Appendix D), could also be an additional resource for this study.

# Appendix A

## Physical Self-Perception Questionnaire

---

**Assess your weight status by answering the following question:**

**Do you consider yourself now to be overweight, underweight, or about the right weight?**

*Please circle one of the following:*

**OVERWEIGHT UNDERWEIGHT ABOUT THE RIGHT WEIGHT**

---

Appendix B

# Missouri Southern State University

## Informed Consent

You are being asked to participate in a research study entitled Determining the Relationship between Physical Self-Perception of Body Fat and Actual Body Fat Measures of University Female Athletes and Non-Athletes. The purpose of this research is to determine the strength of the relationship between perception of body fat and actual measures of body fat. The research is to being conducted by Shannan Borgard under the supervision of Dr. Jean Hobbs in the Kinesiology Department of Missouri Southern State University.

Please be aware that your participation is entirely voluntary, and you are not obligated to participate. If you choose to participate, you will be asked to be involved in an assessment using bioelectrical impedance analysis (BIA). The Omron instrument is a BIA used to estimate body fat percentage. It is considered a safe method which uses an unfelt, low energy, high frequency electrical signal. Please note that there is relatively little to no risk involved in this method. The results of this body composition analysis will aid in determining whether the subject has a healthy perception of body fat percentage. We cannot and do not guarantee or promise that you will receive any benefits from this study. In addition, you will be asked to complete a questionnaire related to your weight status. Your decision whether or not to participate will not prejudice your future relations with Missouri Southern State University. You have the right to decline from participation or terminate participation in this study at any time without penalty.

The duration of this assessment and questionnaire is expected to last no more than 20 minutes on one occasion. All information will be kept confidential. Presentation or publication of this data will occur only in a group format, and you will in no way be identified individually. If you have any questions concerning this project, please feel free to contact Dr. Jean Hobbs at hobbs-j@mssu.edu. If you have any questions regarding your rights as a participant or you feel you have been placed at risk by participating in this project, please contact the Chair of the Institutional Review Board Dr. Delores Honey at honey-d@mssu.edu.

Thank you for your time and cooperation in this research study.

Participant Signature ____________________________ Date_________________

Signature of Witness_____________________________ Date_________________

Signature of Investigator__________________________ Date_________________

Appendix C

## Recommended Body Fat Ranges

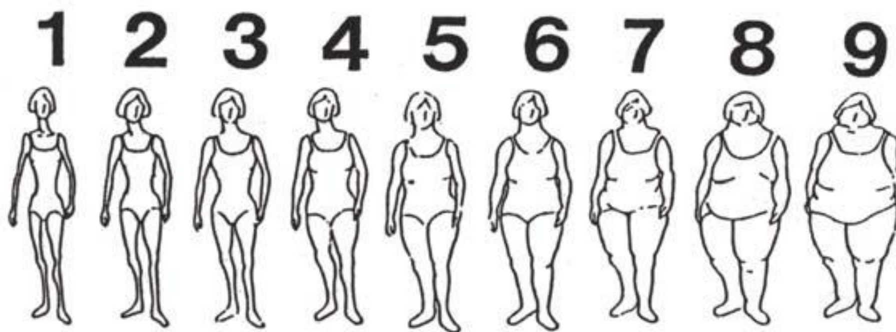
| | AGE | Low [Underweight] | Good [Right weight] | High [Overweight] | Very High [Overweight] |
|---|---|---|---|---|---|
| Female | 20-39 | 5-20 | 21-33 | 34-38 | >38 |
| | 40-59 | 5-22 | 23-34 | 35-40 | > 40 |
| | 60-79 | 5-23 | 24-36 | 37-41 | > 41 |

- Based on Gallagher et al., American Journal of Clinical Nutrition, Vol. 72, Sept. 2000

Appendix D

# NINE FIGURE
# SILHOUETTE SCALE

**DIRECTIONS: On the silhouette continuum provided below, please indicate the figure that you think represents your CURRENT figure and label it (A). Next, indicate the figure that you think represents the *IDEAL figure for success in your sport and label it (B). If you feel you are represented by a figure in-between two given on the continuum,* then please estimate to the nearest tenth of a decimal and label that number with the appropriate letter. (For example- 4.7 would be an appropriate estimation if you feel your current figure is close to, but not exactly, a 5.)**




© Stunkard, Sorenson*, & Schulsinger, 1983*

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