Original Research

Self-estimation of Body Fat is More Accurate in College-age Males Compared to Females

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ABSTRACT

Int J Exerc Sci 5(1) : 72-78, 2012. The objective was to determine the effect of gender on the ability to accurately estimate one's own body fat percentage. Fifty-five college-age males and 99 college-age females participated. Participants estimated their own body fat percent before having their body composition measured using a BOD POD. Participants also completed a modified Social Physique Anxiety Scale (SPAS). Estimated body fat was significantly lower compared to measured body fat percent in females (26.8±5.6% vs. 30.2±7.0%, $p<0.001$) but not in males (16.8±6.8% vs. 18.1±8.3%, $p=0.09$). The mean difference between estimated and measured body fat was significantly higher for females compared to males ($p<0.001$). There was a moderate, significant correlation found between measured body fat percent and SPAS score for males ($r=0.331$, $p=0.014$) and females ($r=.427$, $p<0.001$). Males estimated their body fat percent more accurately than females. Despite these findings, 62% of males and 76% of females underestimated their body fat.

KEY WORDS: Estimated percent fat, body composition, SPAS

INTRODUCTION

Females are often dissatisfied with their bodies, preoccupied with their weight, and many have a negatively skewed perception of their bodies (1-5,8,11,12,15,16). Women with and without eating disorders tend to express a desire to lose weight, which indicates a sense of dissatisfaction with their bodies (2). When compared to men, women are five times more likely to see themselves as overweight, implying that body dissatisfaction may be gender specific (5). Also, overweight males consider themselves more "masculine" and have "greater body satisfaction" compared to overweight females who see themselves as "less physically and femininely attractive." Consequently, being overweight may be more psychologically troubling for women (4).

Body dissatisfaction and inaccurate self-assessment of one's body are also evident in young adults. In 2005, 31.5% of American students in the ninth through twelfth grade described themselves as being overweight, and only 13.1% of the students were actually overweight. From this group, more females described themselves as being overweight even though fewer females were actually classified as overweight.

Reinforcing this trend, 45.6% of the students reported that they were trying to lose weight and 61.7% of these students were females (9). This further supports the idea that females tend to have a more negative view of their bodies compared to males.

Despite so many individuals having a desire to lose weight, there has been an increase in the number of individuals that are obese in America over the past 20 years (18). Approximately one-third of adults are now obese in the U.S. (18). This high obesity rate may be linked to the idea that many individuals have a poor understanding of their body composition or a misperception of their bodies (11,15). When comparing self-reported Body Mass Index (BMI) to measured BMI, people often underestimate their BMI due to inaccurate reports of height and weight (13). Both males and females have been found to lack the ability to accurately estimate their level of "fatness" even if they have a good grasp on their body size (11). This suggests a need for more knowledge about the accuracy of body fat self-assessment in both males and females.

The purpose of this study was to determine the effect gender had on the ability of college-age males and females to accurately estimate one's own body fat percentage. A secondary purpose was to determine if a relationship existed between body image and the accuracy of estimation of body fat percentage. It was hypothesized that there would be a significant difference between males' and females' accuracy when they self-assessed an estimation of their body fat percent.

METHODS

Participants

The population targeted was 19-23 year old males and females who were attending a four-year university and enrolled in a physical activity class. The exclusion criteria included any participants who did not adhere to the experimental protocol or who had their body composition measured within the last year. All the students enrolled in the physical activity classes were recruited for this study which totaled 245, but only the data for 55 male and 99 females was used due to their complete adherence to methodology protocol. Before collecting data, the protocol was approved by the local Institutional Review Board, and written informed consent was obtained from all participants.

Instrumentation

There were three main instruments used in this study. The first was a modified version of the Social Physique Anxiety Scale (SPAS). It was comprised of 12 questions that were used to evaluate an individual's anxiety when he or she was having his or her physique evaluated (6,17). This test was chosen as a way to establish the body image of the participants which could have been a factor in the subjects' ability to accurately self-assess their body fat percentage.

The BOD POD (Life Measurement, Inc., Concord, CA) was used to assess body composition of each participant (7,10). In this study, the predicted thoracic gas volume was used instead of measuring the thoracic gas volume which has a ±2% body fat difference when compared to the measured thoracic gas volume (14). All the

tests followed proper BOD POD protocol recommended by the manufacturer (7).

The last instrument was a poster provided by Life Measurement, Inc. (Concord, CA). The poster consisted of a chart describing six different categories with ranges of body fat percentages. The six categories were denoted by a descriptive label (such as "excess fat"), a percentile range (such as 13-20% body fat), and photographs of actual humans who were classified into the particular range of body fat percent for the category. For males, the following percents of body fat were associated with the six categories: risky (high fat) was >30%, excess fat was 21-30%, moderately lean was 13-20%, lean was 9-12%, ultra lean was 5-8%, and risky (low body fat) was <5%. For women, risky (high fat) was >40%, excess fat was 31-40%, moderately lean was 23-30%, lean was 19-22%, ultra lean was 15-18%, and risky (low body fat) was < 15%.

Procedures

Participants were recruited from the university's physical activity class and were asked to provide written informed consent. Participants also completed the SPAS and the demographics questionnaire prior to being tested in the BOD POD.

In order to prevent bias, neither the purpose nor the hypothesis of the study was shared with the participants. They only knew the project was concerned with self-assessment of body fat percentage. The demographics questionnaire collected the following information: ethnicity, previous physical activity level prior to the fitness class (number of days per week and duration), classification at the university (freshman, sophomore, junior, senior, other.), and self-reported ideal body weight (in pounds). Height, weight, age, and gender were obtained during the BOD POD appointment.

At each BOD POD appointment, it was first established that the student had signed an informed consent when recruited. Then the participant was shown the poster specific to their gender. They chose the category which they thought was most representative of their body fat (risky/high body fat, excess fat, moderately lean, lean, ultra lean and risky/low body fat). The participants then chose a specific body fat percent that they thought was most representative of their body fat. The participant was then measured in the BOD POD by a certified BOD POD tester according to the specific BOD POD guidelines (7).

Statistical analysis

The Statistical Package for the Social Sciences version 16.0 (SPSS Inc., Chicago, IL), was used for all analyses. Descriptive statistics for age, height, weight, ideal weight, exercise frequency, exercise duration, and scores for the SPAS were found in the form of means and standard deviations. Dependent t-tests were used to determine the difference between estimated and measured body fat percent for both males and females. An independent t-test was used to determine the difference between males and females in the ability to accurately estimate one's own body fat. Pearson correlation tests were used to determine the strength of the relationship between SPAS score and measured body fat percent and between SPAS score and the difference in estimated and measured body

fat percent. All tests had an alpha level set at 0.05.

RESULTS

Total participants recruited were 245; however, only the data for 55 males and 99 females were used due to the other participants not providing complete information, dropping out of the experiment, or not adhering to protocol. Table 1 shows several demographics of the participants as well as the SPAS scores. Females had significantly higher SPAS score ($p<0.001$), and the difference between current body weight and self-reported ideal body weight was significantly higher for females compared to males ($p<0.001$).

Table 1. Participant characteristics and SPAS scores.

	Males (N=55)	Females (N=99)
Age (yrs)	20.1 ± 1.0	19.9 ± 1.0
Height (cm)	181.9 ± 8.2	166.1 ± 7.4
Weight (kg)	80.9 ± 14.7	63.8 ± 11.8
Self-reported Ideal Weight (kg)	80.1 ± 11.7	57.9 ± 6.3
Difference in Weight & Ideal Weight (kg)	0.7 ± 6.7	5.9 ± 7.7*
Exercise Frequency ($d \cdot wk^{-1}$)	3.2 ± 1.8	2.7 ± 1.6
Exercise Duration ($min \cdot d^{-1}$)	39.8 ± 20.9	33.5 ± 18.8
SPAS Score	28.0 ± 9.0	35.0 ± 8.0*

Values are the mean ± SD.
* $p<0.001$ vs. males SPAS score

Figure 1 represents the results for males and females when comparing their estimated to their measured body fat percentages. For males, there was not a significant difference between estimated and measured body fat percent ($p=0.09$), and the mean difference was -1.3±5.6%. For females, estimated body fat was significantly lower than measured body fat percent ($p<0.001$), and the mean difference was -3.4±4.8%. The accuracy of the estimate, or difference between measured and estimated body fat percentage, was significantly better in males (-1.3±5.6%) compared to females (-3.4±4.8%; $p=0.02$). Of the 55 males, 62% underestimated their body fat and of the 99 females, 76% underestimated their body fat.

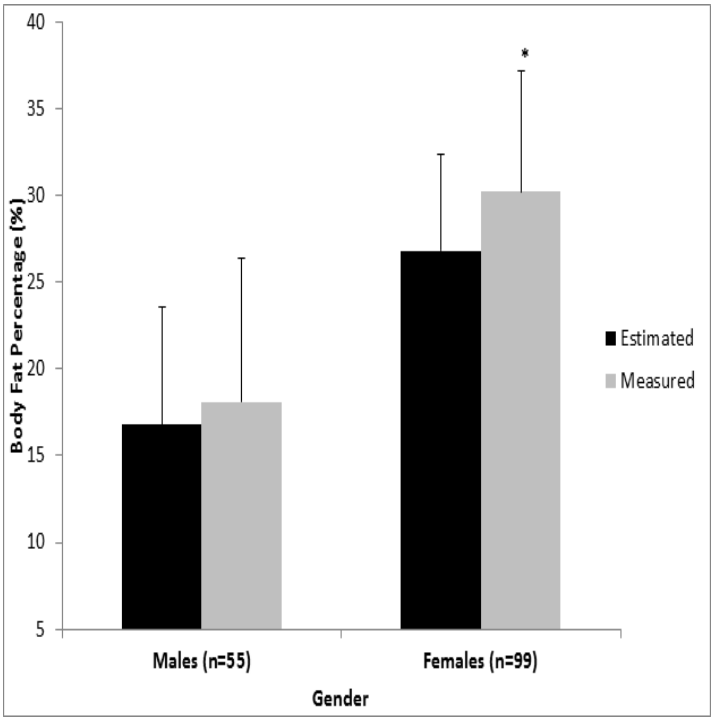

Figure 1. Estimated vs. measured body fat percentage in males and females (values are mean±SD). * Indicates significant difference from estimated ($p<0.001$).

There was a significant correlation between the measured body fat and the SPAS scores for females ($r=0.427$, $p<0.001$; Figure 2) and males ($r=0.331$, $p=0.01$; Figure 3). However, no significant relationship was found between SPAS scores and the accuracy of a participant's estimation (i.e. – difference between measured and estimated) for females ($r=-0.08$; $p=0.45$; Figure 4) or males ($r=0.12$; $p=0.34$; Figure 5).

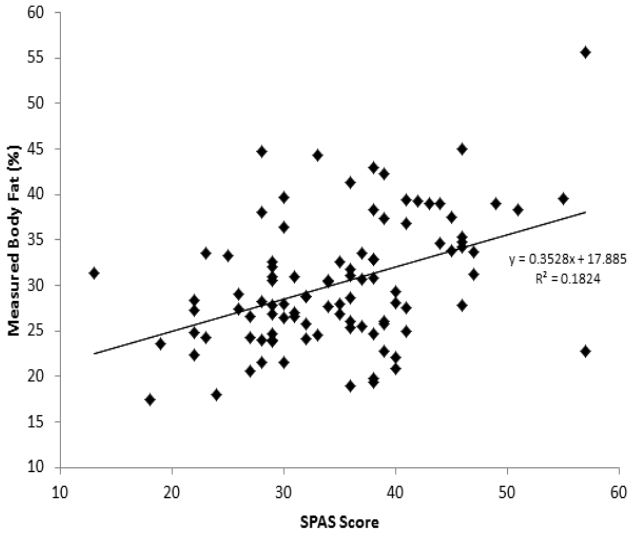

Figure 2. Relationship between SPAS score and measured body fat (%) in females (r = 0.43, p < 0.001).

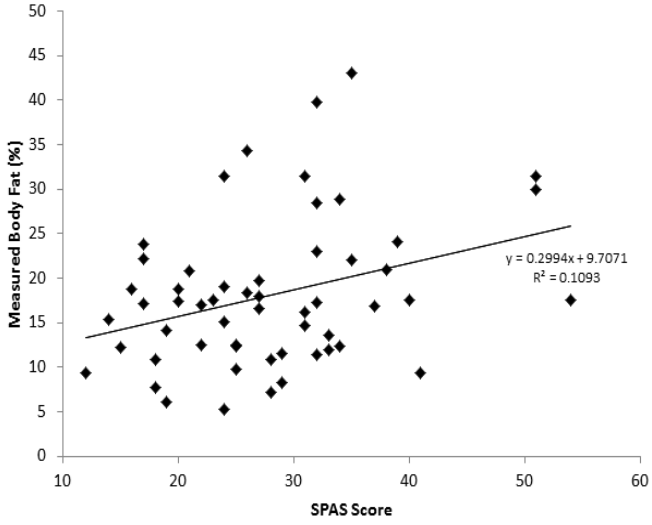

Figure 3. Relationship between SPAS score and measured body fat (%) in males (r = 0.33, p < 0.05).

DISCUSSION

The purpose of this study was to determine the effect gender had on the ability of college-age males and females to accurately estimate one's own body fat percentage. The primary finding was that gender did

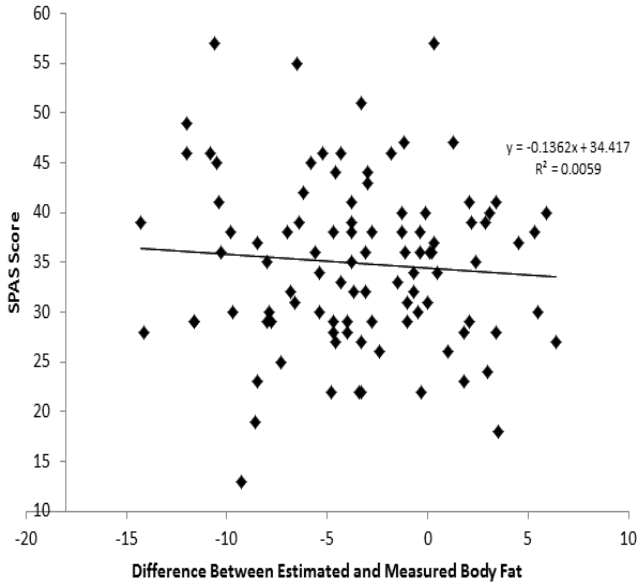

Figure 4. Relationship between female SPAS score and the difference in their estimated and measured body fat percentage (r=-0.077, p=0.45).

significantly affect how accurately an individual can self-assess his/her body fat percentage. While previous studies focused on participants perceived level of "fatness," our study was unique because participants estimated their own body fat percent rather than documenting a feeling of "fatness" (11).

Our results showed that females significantly underestimated their percentage of body fat. Women tend to underreport their weight, while both males and females may have a tendency to underreport BMI due to underreporting weight (13,16). However, women have been shown to overestimate their level of "fatness" when using descriptors to assess their body image (11), or when asked if they are overweight (9). Different methodology in this study could account for these contrary findings because the participants in this study self-assessed their actual percent value rather than a feeling of

"fatness" or being "overweight." This suggests that while women may perceive themselves as being overweight, and may describe themselves qualitatively as more overweight than they actually are, when asked to provide a number for their body weight or body fat, they tend to underestimate this value. It appears the quantification of body size results in an underestimation, while a qualitative assessment results in overestimation. This discrepancy warrants further investigation.

In an attempt to determine factors that might be related to the fact that females underestimated their body fat to a greater degree than males, we had the participants complete the SPAS. We wanted to determine whether one's body image affected the body fat percentage that was reported. The females had significantly higher SPAS scores than the males, which supports the idea that females have a lower body image or a more negative perception of their bodies compared to males. Also, for both genders there was a moderate, significant correlation with measured body fat percent and SPAS scores. This suggests that higher body fat is correlated with more anxiety about one's body. However, when considering the difference between measured and estimated body fat (i.e. – accuracy of estimation) and SPAS score, no relationship was found for either gender. According to our data, this suggests that one's body image, as measured by SPAS score, does not explain why females underestimated their body fat to a greater extent than males.

Previous studies have found that women have negatively skewed perceptions of their bodies (3-5, 11, 12, 15), and whether a woman has an eating disorder or not, females express a desire to lose weight (2, 9). Our data show that females are not only less satisfied with their body, as measured by the SPAS, they report significantly greater magnitude of difference between actual weight and ideal weight, compared to males.

Overall, 62% of males and 76% of females underestimated their body fat percent which suggests that both genders had a tendency to underestimate their body fat. Future studies could investigate this tendency for both genders to underestimate their body. Although only females significantly underestimated their body fat, both males and females may need more education on how to determine body composition and levels of body fat that are considered healthy (11).

This study was limited to students who were enrolled in a general wellness course at the university. It was assumed that these students were similar in their knowledge of their own body fat percentage. We attempted to control this potential source of error by disqualifying students from the study if they had a body composition assessment within the past year.

The main finding of this study was that females significantly underestimated their body fat percentage. Females especially need more education on how to gauge one's body composition and what high levels of body fat signify from a health standpoint. Although not statistically significant, males had a tendency to underestimate their body fat. These findings could be interesting factors in helping health professionals assist college

students in maintaining both a healthy body image and body composition.

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