



*Original Research*

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## **An Investigation of the Differences between Perceived vs. Measured Body Composition, Social Physique Anxiety, and Overall Appearance Satisfaction among College Students**

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### ABSTRACT

*International Journal of Exercise Science* 11(5): 957-967, 2018. The purpose of this study was to examine the differences between body composition, social physique anxiety (SPA) and appearance satisfaction among college students by sex and BMI. A secondary purpose was to assess levels of appearance satisfaction before and after body composition testing and discover any differences between perceived body fat percentage (BF%) and weight versus actual measurements. Participants included 212 college students (93 males, 119 females), 22.0 ± 2.2 years. They answered a demographic questionnaire, the Social Physique Anxiety Scale (SPAS), post-assessment questions, and underwent body composition testing via dual energy x-ray absorptiometry (DXA). There was a significant correlation between measured BF% and SPAS scores ( $r = 0.531$ ,  $P < 0.001$ ). Males scored lower on the SPAS compared to females ( $25.3 \pm 9.4$  vs.  $33.1 \pm 9.1$ ,  $P < 0.001$ ). The sample underestimated BF% with females underestimating by more than males,  $5.7 \pm 7.3\%$  vs.  $3.7 \pm 5.4\%$ ,  $P = 0.036$ . There was no difference between perceived and measured weight for women ( $P = 0.500$ ) however, males overestimated their weight ( $P = 0.004$ ). There was a difference in appearance satisfaction pre and post body composition for females (pre =  $4.4 \pm 1.7$ , post =  $4.2 \pm 1.9$ ,  $P = 0.026$ ) but not for males (pre =  $5.3 \pm 1.5$ , post =  $5.0 \pm 1.8$ ,  $P = 0.063$ ). Overall, males had lower levels of SPA and higher levels of appearance satisfaction than females and knowledge of BF% negatively affected appearance satisfaction scores for females. Finally, both males and females underestimated BF% compared to DXA.

**KEY WORDS:** Body fat, body mass index, body image, body satisfaction

### INTRODUCTION

Body satisfaction is comprised of three basic components: body cathexis, body image, and weight satisfaction (12, 13, 20). Jourard and Secord explain body cathexis as an individual's satisfaction with specific aspects of his or her body as opposed to satisfaction with their body as a whole (20). Body image, on the other hand, reflects how an individual perceives his or her body shape and size. Often times body image is contingent upon ideal body shape. Therefore,

if a person's perceived body shape is similar to their ideal body shape, they will have a more positive body image (13). Finally, weight satisfaction refers to the relationship between an individual's ideal weight and current weight (12, 13).

While body satisfaction is an issue which both men and women may struggle with, the ideal body type for each sex is different (6, 11, 13, 28). Early research indicates that women desired to be thin and placed a greater interest on weight while men were more focused on body shape (2). Previous literature suggests that men desire bigger, more muscular bodies and a higher body weight in comparison to females (13, 25, 28). Neighbors et al. conducted a study in which two groups of undergraduate students, one group in 1990 and one in 2005, were asked about their weight and body satisfaction (24). The results showed that normal and overweight women had decreased levels of body weight dissatisfaction in 2005 compared to 1990 while body weight dissatisfaction increased among underweight women. Overall, men's body weight dissatisfaction did not change, with the majority of men desiring to gain weight in both samples. A more recent investigation looking at perceived versus ideal body size in female college students found that the majority of women identified the ideal female body type as underweight indicating that being thin is still an ideal in this population (22). Traditionally, college women tend to be more interested in weight management and body image (21) and less satisfied with their bodies than college men (27). Forrest and Stuhldreher examined body dissatisfaction and distortion among college students and reported similar findings with females two times as likely as males to report dissatisfaction with their bodies (11). Further, more female than male students felt their body image was not attractive to the opposite sex (11). While many investigations focus on women, research conducted with just males found a correlation between elevated body mass index (BMI) and poor body image (31).

Social physique anxiety is a term used to describe anxiety that is experienced when a person perceives that their physique is being negatively judged by others (17). Evidence shows women, overall, have higher anxiety levels than men regarding their personal appearance and how others view their physique (7, 14). Additionally, research has been conducted to identify the relationship between BMI and social physique anxiety. Previous literature indicates that underweight college students displayed lower social physique anxiety than those who were normal weight, overweight, or obese (10). Further, Hausenblas and Fallon reported that college aged females with a higher BMI displayed higher levels of social physique anxiety, though BMI was not related to social physique anxiety in males (18). Finally Hagger and colleagues found that among young people aged 11-22 years, social physique anxiety was higher in the older individuals (14), but it is not known whether social physique anxiety remains stable through the college years.

It has been noted in the literature that discrepancies exist when individuals, especially females, perceive their body weight status to be different from their actual weight status (16, 29). This has been, in part, explained by a shift in perceptions of what normal and healthful body weight is (4). In terms of perceived body fat percent compared to measured body fat, Campisi et al. found that women underestimated their body fat percentage while males did not have a significant difference between perceived and measured body fat (5). The same is true for

Hancock et al. who also found that women underestimated body fat but males did not (15). With the implications of misunderstanding one's weight and body composition and possible effects on overall health status, it is important to determine if young adults are informed on such variables and if learning about one's body composition has any impact on lifestyle.

While the literature has demonstrated some patterns regarding social physique anxiety, there remains a gap in the literature regarding measured body composition and how it relates to perceptions of one's physical appearance. Young adults are establishing behaviors that will have an impact on overall quality of life and understanding how these variables interact can help inform decisions regarding policy and resources across campuses. Therefore, the primary purpose of this study was to examine the differences between appearance satisfaction, social physique anxiety and body composition among college students by sex and BMI. The secondary purpose was to determine levels of appearance satisfaction before and after body composition testing and discover the accuracy/differences of perceived body fat percentage and weight versus actual measurements.

## **METHODS**

### *Participants*

Participants were men and women between the ages of 18-28 years who were enrolled in a large public university in the southeast region of the United States. Written informed consent was obtained prior to participating. Women were excluded if pregnancy was indicated. Participants attended a pre-scheduled session in which they completed multiple surveys and had their body composition assessed. Incentive for participating in the study was free body composition testing. The sample size obtained exceeded the minimum that was calculated with an a priori analysis for a moderate effect size.

### *Protocol*

Before recruitment commenced, approval for the study was obtained from the university's Institutional Review Board. After signing the consent form, participants were asked to complete the demographic questionnaire and the Social Physique Anxiety Scale (SPAS). Participants were encouraged to respond honestly and reminded that all responses were anonymous and results would be kept confidential. Upon completion of the questionnaires, height and weight were measured using a Tanita WB-3000 (Tanita, Arlington Heights, IL) digital physician's scale. Body composition was assessed with a dual-energy x-ray absorptiometry (DXA) (General Electric, Madison, WI) scan, which is a valid and reliable non-invasive procedure that measures fat, lean body mass, and bone mineral content (19). Participants were instructed to lie down on the DXA scanning table and were positioned for the scan per manufacturer instruction.

Following the scan, participants received a short debriefing on their body composition results. They were made aware of their percent body fat from the results of the DXA scan and were given an explanation as to their health status in relation to the norms for an individual of their age and sex. After disclosing and discussing the participants' results, they were asked to answer a final post-assessment questionnaire.

**Demographic Information:** Basic demographic information was collected for each participant including current level of satisfaction with one's physical appearance and whether pressure was felt to achieve or maintain a certain physical appearance. Participants were also asked to estimate their current weight and body fat percentage and to categorize their weight status as underweight, normal weight, overweight, or obese based only on their perception and not from knowledge of current BMI. These variables were used for comparison to the actual measures collected by the researchers. Appearance satisfaction was assessed with a single question using a 7 point Likert-type scale, with 1 being "Extremely dissatisfied/unhappy" 4 indicating "Neither dissatisfied/unhappy or satisfied/happy" and 7 being "Extremely satisfied/happy."

**Social Physique Anxiety Scale:** The Social Physique Anxiety Scale (SPAS) is a reliable, validated scale developed in 1989 by Hart, Leary, and Rejeski (17, 26). It consists of 12 items which are answered using a 5 point Likert-type scale. Responses measure how characteristic the statement is of the individual, 1 being "not at all characteristic of me" and 5 being "extremely characteristic of me." All items inquire about levels of anxiety and nervousness or comfort with one's body in a variety of situations. The scale is scored by summing the responses after five of the items (questions 1, 2, 5, 8, and 11) are reversed scored. Scores range from 12-60; a high score represents high levels of anxiety and a low score represents low levels of anxiety. This scale was administered before the body composition testing commenced.

**Post-Assessment Questionnaire:** The post-assessment questionnaire was created by the researchers. Appearance satisfaction was assessed again using the same question from the demographic questionnaire to determine if knowledge of one's body composition affected their level of appearance satisfaction. Questions were also asked regarding any exercise or dietary changes participants may make due to knowledge of their body composition.

#### *Statistical Analysis*

Data were analyzed using SPSS 24.0 (SPSS, Inc. Chicago, IL). Descriptive statistics were determined for demographic information including sex, age, height, weight, body fat percentage, and body mass index (BMI). Cronbach's alpha was used to measure the internal consistency of the 12 items on the SPAS to ensure all items were functioning. One-way analysis of variance (ANOVA) (with *post hoc* = Bonferroni alpha 0.05) was used to compare the SPAS score of the total sample by sex, BMI, whether they felt pressure to maintain appearance and year in school. Repeated measures ANOVA was used to examine the interaction of time, sex, and BMI regarding appearance satisfaction and SPAS. Pearson correlations were used to determine the relationship between SPA and BF% and BMI. A paired samples t-test was used to compare appearance satisfaction before and after body composition testing, and to determine any differences between participants' perceived weight and BF% and measured weight and BF% and repeated measures ANOVA was used to compare between sexes. A one-way ANOVA was used to compare differences between perceived and measured BF% and weight by sex and BMI. Pearson chi-square was used to assess the relationship between categorical variables.

## RESULTS

A total of 212 college students aged  $22.0 \pm 2.2$  years participated in the study. The majority of the sample were Caucasian (74%) and Table 1 shows the demographic information. Table 2 displays the sample by year in school.

**Table 1.** Participant Characteristics (Mean  $\pm$  SD)

	Total (N = 212)	Males (N = 93)	Females (N = 119)
Age (years)	$22.0 \pm 2.2$	$22.4 \pm 2.4$	$21.7 \pm 2.0^*$
Height (cm)	$170.5 \pm 9.5$	$178.0 \pm 7.1$	$164.6 \pm 6.4^*$
Weight (kg)	$71.9 \pm 18.3$	$81.3 \pm 18.9$	$64.6 \pm 14.1^*$
Body fat (%)	$24.3 \pm 10.8$	$17.1 \pm 9.2$	$29.8 \pm 8.5^*$
BMI ( $\text{kg}/\text{m}^2$ )	$24.3 \pm 4.5$	$25.4 \pm 4.9$	$23.5 \pm 4.1^*$

\*Significantly different from males,  $P < 0.05$

**Table 2.** Participants by year in school

Year in School	N
1	22
2	41
3	49
4	58
$\geq 5$	42

Social Physique Anxiety Scale: Cronbach's alpha was considered excellent at 0.908 indicating overall internal consistency and reliability for the SPAS in this sample (3, 8). There were no differences between any year in school with all multiple comparisons resulting in  $P = 1.000$  for each comparison (Table 3). SPA was correlated to BF% ( $r = 0.531$ ,  $P < 0.001$ ) and BMI ( $r = 0.262$ ,  $P < 0.001$ ).

**Table 3.** Social Physique Anxiety by year in school

Year in School	SPA score
1	$30.6 \pm 9.7$
2	$28.8 \pm 9.4$
3	$29.4 \pm 8.9$
4	$30.9 \pm 11.0$
$\geq 5$	$29.7 \pm 10.1$

No differences between year in school ( $P = 1.000$ )

A one-way ANOVA comparing total score on the SPAS by sex, BMI, pressure to achieve or maintain a certain physical appearance, and year in school revealed the following: Males had a lower mean score than females, indicating males experienced lower levels of social physique anxiety than females (Table 4). Participants were further categorized by BMI, specifically those with a BMI of  $\leq 24.9 \text{ kg}/\text{m}^2$  ( $N = 142$ ) and those  $\geq 25.0 \text{ kg}/\text{m}^2$  ( $N = 70$ ), and those with a lower BMI scored lower on the SPAS (Table 4). Those who indicated pressure to achieve or maintain

a certain physical appearance scored  $34.4 \pm 9.3$  compared with  $24.8 \pm 8.2$  for those who did not ( $P < 0.001$ ).

Appearance Satisfaction: Repeated measures ANOVA revealed an overall decrease in appearance satisfaction for the entire sample, but there was no interaction between sex and pre and post body composition appearance satisfaction ( $P = 0.953$ ). There was also no interaction between BMI category and pre and post appearance satisfaction ( $P = 0.164$ ). Participants with a BMI  $\leq 24.9$  had higher levels of appearance satisfaction both pre and post body composition testing in comparison to those with BMI  $\geq 25.0$ ,  $P < 0.001$  (Table 4).

A one-way ANOVA was used to analyze whether there were significant differences between male and female appearance satisfaction. Males displayed significantly higher levels of appearance satisfaction than females both prior to body composition testing and after having knowledge of their body composition (Table 4).

A paired samples t-test revealed that there were no significant differences between appearance satisfaction pre and post body composition when analyzing only male participants (pre =  $5.3 \pm 1.5$ , post =  $5.1 \pm 1.8$ ,  $P = 0.063$ ). However, there were significant differences between appearance satisfaction scores pre and post body composition for female participants (pre =  $4.4 \pm 1.7$ , post =  $4.2 \pm 1.9$ ,  $P = 0.026$ ). While one difference was significant and the other one wasn't the magnitude of the change pre-to-post was roughly equal between men and women.

Chi-square demonstrated that women were more likely to feel pressure to achieve or maintain a certain physical appearance ( $X^2 = 7.7$ ,  $P = 0.006$ ), however, BMI classification had no relationship with appearance pressure ( $X^2 = 0.118$ ,  $P = 0.731$ ).

**Table 4.** Social Physique Anxiety and Appearance Satisfaction by sex and BMI (Mean  $\pm$  SD)

Social Physique Anxiety		
Males	Females	<i>P</i> -value
$25.3 \pm 9.4$	$33.1 \pm 9.1$	$< 0.001$
BMI $\leq 24.9$ kg/m <sup>2</sup>	BMI $\geq 25.0$ kg/m <sup>2</sup>	<i>P</i> -value
$28.0 \pm 8.6$	$33.0 \pm 11.6$	$= 0.001$
Appearance Satisfaction pre and post body composition		
Males (Pre)	Females (Pre)	<i>P</i> -value
$5.3 \pm 1.5$	$4.4 \pm 1.7$	$< 0.001$
Males (Post)	Females (Post)	<i>P</i> -value
$5.1 \pm 1.8$	$4.2 \pm 1.9$	$= 0.002$
BMI $\leq 24.9$ kg/m <sup>2</sup> (Pre)	BMI $\geq 25.0$ kg/m <sup>2</sup> (Pre)	<i>P</i> -value
$5.2 \pm 1.4$	$4.1 \pm 1.9$	$< 0.001$
BMI $\leq 24.9$ kg/m <sup>2</sup> (Post)	BMI $\geq 25.0$ kg/m <sup>2</sup> (Post)	<i>P</i> -value
$5.0 \pm 1.7$	$3.6 \pm 2.0$	$< 0.001$

Perceived Weight and Measured Weight: The results of a paired samples t-test showed no significant difference between participants' perceived weight and measured weight in the overall sample ( $P = 0.929$ ). However, the difference between perceived versus measured weight

was significant in males but not for females (Table 5). A repeated measures ANOVA showed no interaction by sex in regard to differences between perceived body weight and measured body weight ( $P = 0.218$ ). Pearson chi-square analysis revealed a significant relationship between BMI classification and perceived weight classification ( $X^2 = 104.9$ ,  $P < 0.001$ ), with 141 participants reporting a weight class that was the same as their calculated BMI classification. Of those that did not accurately classify their weight category, 53 placed themselves in a lower weight class.

Perceived Body Fat% vs. Measured Body Fat%: A paired samples t-test comparing perceived BF% and measured BF% revealed that both males and females significantly underestimated their BF% (Table 5). A repeated measures ANOVA showed an interaction by sex in regards to perceived of body fat percentage and measured body fat ( $P = 0.048$ ). Results from a one-way ANOVA showed that females underestimated BF% by a larger margin than males ( $5.7 \pm 7.3\%$  vs.  $3.7 \pm 5.4\%$  respectively,  $P = 0.035$ ) and that those with a BMI  $\geq 25.0$  kg/m<sup>2</sup> underestimated BF% by a larger margin than those with a BMI  $\leq 24.9$  kg/m<sup>2</sup> ( $6.5 \pm 6.9\%$  vs.  $4.0 \pm 6.3\%$  respectively,  $P = 0.011$ ).

**Table 5.** Perceived and measured BF% and weight (Mean  $\pm$  SD)

	Perceived BF%	Measured BF%	P-value
Men	13.7 $\pm$ 8.4	17.3 $\pm$ 9.2	< 0.001
Women	24.5 $\pm$ 7.3	29.7 $\pm$ 8.4	< 0.001
	Perceived weight (kg)	Measured weight (kg)	P-value
Men	80.8 $\pm$ 15.3	80.2 $\pm$ 15.1	= 0.004
Women	63.5 $\pm$ 13.2	64.0 $\pm$ 12.6	= 0.500

Post-assessment Questionnaire: Following body composition testing participants were asked about behaviors they might change after learning about their body composition. For males, 50% said they would engage in more cardiovascular exercises, 32% said they would engage in more strength training exercises, and 28% said they would exercise more frequently. For females, 57% said they would engage in more cardiovascular exercises, 40% said they would engage in more strength training exercises, and 58% said they would exercise more frequently. For changes to diet, 44% of males thought they should change eating habits with 70% of those respondents indicating a decrease in caloric intake was necessary, and 65% of females thought they should change eating habits with 95% of those respondents indicating a decrease in caloric intake was necessary.

## DISCUSSION

The primary purpose of this study was to examine the differences between appearance satisfaction, social physique anxiety and body composition among college students by sex and BMI. The secondary purpose was to determine levels of appearance satisfaction before and after body composition testing and discover the accuracy/differences of perceived body fat percentage and weight versus actual measurements. This study found significant differences between males and females, and by BMI classification on the SPAS ( $P \leq 0.001$ ). There were also significant differences between participants' perceived and measured BF% ( $P < 0.001$ ), however only males had a significant difference with perceived and measured weight, with males

overestimating weight. It is important to note that while males had a significant difference with perceived and measured weight and females did not, the magnitude of the differences were similar between the sexes as indicated by the lack of a significant interaction by sex.

On average, females scored higher on the SPAS compared to males indicating females have higher levels of social physique anxiety. These findings are consistent with those reported by Lindsey et al. claiming females are more concerned with body image than men (21). Furthermore, a study conducted by Martin et al. administered the SPAS to a group of male college students and reported that scores per item averaged 2.29, suggesting that college aged males have relatively low levels of social physique anxiety (23). Additionally, SPAS had a stronger positive correlation to BF% than BMI. The results of the current investigation also suggest that college-age individuals with low BMIs have higher levels of appearance satisfaction. This is consistent with previous findings where low BMI measures were also related to higher levels of body satisfaction (11).

Past literature has reported that males had higher levels of body satisfaction than females. A study comparing gender differences in body image reported that, on average, females desire a body frame that is smaller than their current figure (13). In a different study in which participants were asked how they felt about the size of their thighs, 83% of females reported they were too fat while only 11% of men shared the same sentiment. Forrest and Stuhldreher (11) and Cattikas (6) also conducted studies which found females were more likely to be dissatisfied with their bodies while men displayed higher levels of body satisfaction. The current investigation found a significant difference in appearance satisfaction between the sexes as well. Male participants had higher levels of appearance satisfaction than women both before ( $P < 0.001$ ) and after knowing their body composition ( $P = 0.002$ ) with males averaging scores that indicate some satisfaction with appearance as opposed to being neutral or feeling unsatisfied. Additionally, the young women in this study were more likely to report pressure to maintain or achieve a certain physique compared to men. This could suggest that women feel more societal pressures to achieve a certain appearance. Previous findings suggest that men desire bigger, more muscular bodies and a higher body weight in comparison to females (13, 25, 28). Females have been found to be more weight conscious and interested in weight management than men (21, 30). The results of the current investigation yielded a significant difference between perceived and measured weight for males, with males overestimating their weight, while females displayed no significant difference. This differed from the findings of Harring et al. (16) which found females reported inflated body weights and males reported deflated body weights and Hancock et al. who found males accurately perceived BF% while women did not (15). On the contrary, in this investigation both males and females underestimated their BF% compared to the DXA scan.

This study was carefully designed and implemented. However, some limitations could not be avoided. Due to the nature of survey data, all responses to the demographic questionnaire, SPAS, and post-assessment questionnaire were self-reported. Though encouraged by the researchers to answer all questions honestly and reassured all responses would be anonymous, the participants may not have responded truthfully to the inquiries. While this study sought to

determine the immediate impact of learning BF%, this study was cross-sectional and therefore actual changes in lifestyle and/or behavior are unknown. Additionally, the majority of the sample was Caucasian and young, making results not generalizable outside of this population. Finally, while some results indicated significant differences the magnitude of those differences were similar. Despite limitations, there were strengths in the study. Data were collected on a relatively large sample size with near even representation of male and female participants (44% and 56% respectively). Additionally, body composition was measured using DXA, a highly accurate, reliable, and validated measure. The SPAS, also shown to be valid and reliable, was used as a tool to determine social physique anxiety. Finally, this study was unique in its ability to capture participants' thoughts about their appearance satisfaction immediately after gaining knowledge of their body composition.

Regardless of SPA levels, the differences in perceived versus measured BF% demonstrate that college students do not have an accurate self-concept regarding their body composition, however gaining knowledge of their BF% prompted the majority of participants to state that more physical activity was indicated. This is interesting since according to recent data from the American College Health Association, the majority of students desire information regarding physical activity, but only 42% of students reported receiving information about physical activity (1). Health and fitness resources at the collegiate level, such as classes, recreation centers, health clinics and athletic departments need to provide students with more information about body composition and how it relates to overall health status as well as tools to develop a positive self-image. An accurate measure of body composition should inform a student about the current state of their body and help guide them in developing an effective diet and exercise plan. Perhaps health clinics and student recreation centers on college campuses could also teach students about the benefits of knowing their body composition and how it can help them tailor their physical activity to achieve and maintain a healthy body. In this way, the findings of this study could be especially beneficial to individuals working with college students in any capacity who may directly or indirectly address students' weight or body composition such as professors, coaches, trainers, and health clinic personnel. While knowledge of body composition acted as a trigger for many students to begin thinking about what they should be doing different in terms of exercise and eating behaviors caution should be used when counseling students as this could also trigger negative behaviors such as disordered eating or unhealthy amounts of exercise (9, 18, 22). Further research could investigate the use of body composition testing as a catalyst to take action and a motivational instrument for beginning and maintaining an exercise regimen.

In conclusion, despite possible shifts in what society deems a healthy weight, social physique anxiety remains an issue for young women and those with higher BF%. Providing a comfortable and inclusive environment for these individuals to engage in physical activity should be priority regarding positive health initiatives. Further, knowledge of BF% may be a factor in initiating behavior change, therefore having the ability to accurately assess body composition coupled with consistent and correct information about how to improve one's profile should be considered across college campuses.

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