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The Impact of Weight Perception on the Health Behaviors of College Students

Jessica Osborn, Mildred Naquin, Wynn Gillan, and Ashley Bowers

Kinesiology and Health Studies, Southeastern Louisiana University

ABSTRACT

Background: Obesity has links to numerous health problems. Having an accurate perception of one's own weight is an important aspect of maintaining an appropriate weight. **Purpose:** The purpose of this study was to examine relationships among perceived body weight, actual body weight, body satisfaction, and selected health behaviors. **Methods:** The study was conducted at a southern Louisiana university with students enrolled in undergraduate classes. A total of 515 students participated in this study. **Results:** Students were mostly female (68%), Caucasian (68%), and freshmen (59%). Freshmen had significantly lower body mass index (BMI) measurements than seniors. Several health behaviors had significant relationships with BMI, including drinking diet soda, eating at the student union, and stress eating. Weight perception was related to scores on the Body Satisfaction Scale (BSS), where students who were more overweight scored higher on the BSS, indicating dissatisfaction. **Discussion:** Overall, students had an accurate perception of their weight but overreported height. The mean BMI for all students was considered overweight, indicating need for weight loss interventions. **Translation to Health Education Practice:** It is important to monitor a variety of health behaviors in a university student population. This information can be used to indicate areas where health education interventions are needed.

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Background

Obesity is a major health problem in the United States, affecting roughly one third of adults.[1] There are many health risks associated with obesity, including those that affect physical, mental, and emotional health.[2,3] In 2012, roughly one third of adults in the United States (an estimated 78 million) were classified as obese or overweight. Additionally, 17% of America's youth (ages 2–19) are affected by obesity.[1] The reported prevalence of obesity in 4-year colleges was 15.2% in females and 17.5% in males.[4] From the 2015 National College Health Assessment, 12.7% of all students were classified as obese.[5] The obesity crisis in the United States has slowly been accelerating over the past 25 years. In 1990, the Behavioral Risk Factor Surveillance System conducted by the Centers for Disease Control and Prevention (CDC) reported that only 10 of the 44 participating states had an obesity prevalence of less than 10% and no state had a prevalence equal to or over 15%. Twenty years later, no state would have an obesity prevalence of less than 20% and 12 states would have an obesity prevalence of 30% or greater.[6]

In simple terms, the CDC defines obesity and overweight as labels for weight ranges that are higher than what is typically considered to be healthy based on a particular height-to-weight ratio.[7] These terms also describe a series of weights that have been associated with an increased possibility of certain illnesses and health problems. The unit of measurement for obesity and overweight is currently set using the body mass index (BMI) scale, which is a number that correlates to the amount of body fat a person may have based on his or her height and weight. It is important to note, however, that BMI is not an exact measurement of an individual's body fat and does not take into consideration those with higher quantities of muscle mass.[7]

Effects of obesity on health

Obesity is associated with multiple health problems, including an increased risk for type 2 diabetes, stroke, and coronary heart disease.[7] Obese and overweight individuals are at an increased risk for reproductive problems (including infertility), elevated levels of "bad" cholesterol (low-density lipoproteins) and triglycerides.[2] Other than the obvious physical implications, obesity can also affect mental and emotional health. Weight cycling (chronic weight loss and regain) in women has been shown to be related to lower self-esteem and less overall

CONTACT Jessica Osborn jessica.huber@selu.edu Kinesiology and Health Studies, Southeastern Louisiana University, SLU 10845, Hammond, LA 70402.

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health satisfaction.[3] More women than men tend to report body weight concerns throughout their lives and tend to undergo more emotional grievances from these concerns.[8]

Factors that contribute to obesity

Many factors are associated with the increase in obesity rates, especially when individual behaviors are taken into account. These factors include partaking regularly of foods high in calories and fat, an increase in the consumption of sugary beverages, and a lack of physical activity. Additionally, genetics, quality and quantity of caloric intake, and lack of sleep can contribute to weight gain and obesity.[9]

Obesity status has been shown to be affected by certain dietary behaviors. Nurul-Fadhilah et al. found an inverse relationship between eating breakfast and obesity.[10] Snacking between meals has been shown to cause reduced hunger at mealtimes, with the quality of calories ingested as snacks less nutritionally complete than full meals.[11] Additionally, Jääskeläinen et al. found a relationship between stress eating and obesity.[12] In a Thai study, individuals who consumed sugar-sweetened beverages at a higher frequency were more likely to have weight gain, regardless of gender.[13]

Screen time (amount of time spent in front of a television, computer, or other electronic devices) has been linked to adult and childhood obesity. Maher et al. suggest that increased weight may be more strongly and consistently associated with screen time behavior than exercise behavior.[14] Duncan et al. found that regardless of the amount of time engaging in physical activity, a higher screen time (measured as more than 21 hours a week spent working in front of a computer or watching television) was associated with an increased likelihood of being obese.[15]

Body image, body satisfaction, and weight satisfaction

Body image is a multifaceted concept that relates to a person's feelings and thoughts about his or her body, as well as subjective perceptions of one's body.[16,17] In the 2012 Mission Australia Youth Survey, body image was listed in the top 3 concerns of young Australians.[18] Roughly 15% of the 15 351 survey respondents reported that they were extremely concerned about body image, and another 18.3% of respondents indicated that they were very concerned about body image.[18]

Body dissatisfaction is often characterized by negative thoughts and emotions about one's physical appearance.[19-21] Weight dissatisfaction is the dissonance a person has with his or her body weight and/or body size. Matthiasdottir et al. found in their study of 5832 Icelandic adults (18 – 79 years old) that 42.7% of the study population were not pleased with their body weight.[22] In all of the age groups studied, weight dissatisfaction was more prevalent in females than in males (50.1% in women compared to 35.1% in men). This divergence between the sexes is not uncommon, because women tend to have a lower ideal body weight than men.[23] A feeling of needing to lose weight was the strongest predictor for body weight dissatisfaction in that study.[22]

A racial difference in body satisfaction has also been found. Lower body weights are typically more desired by non-Hispanic whites than any other group.[24] Mikolajczyk et al. found that African American students were less likely to identify themselves as being overweight, even with higher BMI scores.[25] In another study, Pacific Islanders reported a greater acceptance of larger body sizes and had a more positive evaluation of their bodies and physical appearance, even though they had higher BMI scores than their Asian and Caucasian counterparts.[26]

An important part of maintaining an appropriate weight is having an accurate perception of one's own weight. Underestimating body weight has been associated with an increased risk of becoming overweight. Alwan et al. found that a substantial portion of their 1432 student participants (ages 11 – 17) from the Seychelles had an inaccurate idea of their weight and engaged in inappropriate weight control behaviors.[27] Among the normal-weight participants, 15% of the participants considered themselves to be underweight, and 1 in 5 normal-weight students indicated that they wanted to gain weight.[27]

Festinger's 1954 description of the social comparison theory suggests that an individual desires an accurate self-appraisal.[28] This motivates an individual to evaluate him- or herself based on comparison to others.[29] The media has given both men and women a very narrow ideal body shape to emulate. It has been shown in females that an inability to conform to a thin beauty standard can lead to negative affect, body dissatisfaction, potential eating disorders, and/or low self-esteem.[30] Weight satisfaction was shown to have a direct impact on the health of an individual and to be related to healthy lifestyle behaviors.[23] Morgan showed that not only body satisfaction but also body weight and perceived body weight were all significant predictors of dieting behavior.[31]

Purpose

The purpose of this study was to examine relationships among perceived body weight, actual body weight, body satisfaction, and health behaviors. In addition, it determined whether students' self-reported body weight accurately reflected their BMI. Additionally, this study investigated possible relationships among reported weight status and dietary and exercise behaviors.

Methods

Research design and questions

This study was quantitative in design and used surveys to collect information from selected participants. A stadiometer was utilized to measure the students' exact heights. The study also utilized an electronic (bioimpedence) weight scale to determine body weight and estimate percentage body fat.

The research questions included the following:

1. Is there a relationship between self-reported and measured anthropometric measures?
2. Is there a relationship among BMI and scores on the Body Satisfaction Scale (general and subscales)?
3. Is there a relationship between BMI and health behaviors?
4. Is there a relationship between perceived body weight and health behavior?

Participants

Participants in this study consisted of a convenience sample of male and female college students aged 18 and older (range: 18–47 years old). At the time of the study, students were enrolled in undergraduate courses at a university in southeastern Louisiana. Students were selected for participation from classes in the Kinesiology and Health Studies Department, students enrolled in freshman orientation classes, or those who attended walk-in sessions. Students were sometimes offered extra credit by their teachers for attending a walk-in session outside of their class time, scheduled at a time that best suited their class schedule. All students who chose to participate completed the study survey first and then were measured for height, weight, and percentage body fat. The survey took on average 7 minutes to complete; completion of the measurements took roughly 2 minutes per student, excluding wait time. Of all students given the option to participate, approximately 15 refused to partake in the study.

Study instruments

The participants completed a 4-part survey. In total, the survey consisted of 28 questions and was divided into 4 sections. Health behavior questions for this study originated from 2 national studies, the 2013 National Health and Nutrition Examination Survey (NHANES) and the 2015 Youth Risk Behavior Surveillance System (YRBSS) surveys. Some psychometric measurements of these instruments have been documented.[32,33] For example, on approximately 75% of the YRBSS questions the reliability was between 61% and 100% (kappa).[33] Survey-specific questions were selected from the Weight History and Diet Behavior and Nutrition sections of the NHANES and the YRBSS. Additional questions were formulated in order to ask more precise information about health behaviors. Some of the original questions from the NHANES and YRBSS were modified for the survey population. For example, some questions were shortened to include less response choices to simplify the survey. Some questions were modified to reflect the campus environment, including specific dining options.

The first section of the survey consisted of demographic questions. Age, gender, race/ethnicity, and school classification (freshman, sophomore, junior, senior) were asked. Additionally, the participants reported their best estimate of their current height and weight. Self-reported height and weight were used to calculate the students' reported BMI.

The second section of the survey was used to ascertain health behaviors. Dietary behaviors were assessed, including the average number of fruits, vegetables, and green vegetables (i.e., salad) eaten in a day. Additionally the survey collected data on the number of sodas and diet sodas the student drank in a week, how much juice and milk the student drank in a week, the number of times the student ate out at a restaurant during the week, how many frozen meals the student ate in a week, how many times the student ate at the student union, and how many times the student ate at a fast food restaurant each week. Exercise behaviors were also assessed, including the average number of times a student engaged in exercise in a week, the average duration of each exercise session, and the average intensity of each exercise session. Additionally, self-reported average amount of screen time (i.e., time on the computer, watching television, and playing video games) in a day was assessed, as well as self-reported amount of phone usage (i.e., talking on the phone, texting, utilizing social media, browsing the Internet, and playing games). The average number of hours the student slept at night was also obtained through self-reported data.

The third section of the survey assessed self-reported body weight and self-reported concern with body weight. Perceived weight status (underweight, normal weight, overweight, obese) was also asked. Additionally, this section assessed the extent to which participants thought they were overweight, whether they were currently trying to lose or gain weight, and what their ideal body weight would be.

The fourth section of the survey assessed general, head, and body satisfaction utilizing the Body Satisfaction Scale (BSS).[34] The scale utilized a Likert scale rated from 1 (*very satisfied*) to 7 (*very dissatisfied*). Higher scores indicated greater body dissatisfaction. The scale consisted of one general score and 2 subscores, body (which assessed satisfaction with the lower body) and head (which assessed satisfaction with the upper body). The general scale consisted of 16 items; each of the body and head sections consisted of 7 specific questions from the general scale. The range of possible scores on the general section was 16 (*very satisfied*) to 112 (*very dissatisfied*). The range of possible scores on the body and head sections was 7 (*very satisfied*) to 49 (*very dissatisfied*).

For the BSS, internal consistency alpha coefficients for the 3 scales ranged from $r = 0.79$ to 0.89, as originally documented by Slade et al.[34] Cronbach's alpha coefficients were derived for 3 groups. The General Dissatisfaction Scale (16 items) had an internal consistency of 0.871 among college students ($n = 450$), 0.887 among student nurses ($n = 452$), and 0.893 among patients with eating disorder ($n = 84$). The Head Dissatisfaction Scale, consisting of 7 questions, had an internal consistency of 0.803 among college students ($n = 452$), 0.820 among student nurses ($n = 455$), and 0.878 among patients with eating disorder ($n = 84$). Finally, the Body Dissatisfaction Scale (7 items) had an internal consistency of 0.785 among college students ($n = 451$), 0.817 among student nurses ($n = 459$), and 0.789 among patients with eating disorder ($n = 84$).

Weight and body fat scale

After the survey was completed, the students were measured for height and weight. Height was measured by using a stadiometer produced by Seca. Weight and percentage body fat were measured using one of 2 body composition scales: the Omron Body Composition Monitor with Scale (model HBF-500) and the Omron Full Body Sensor Body Composition Monitor and Scale (model HBF-516). Both scales were measured for accuracy and reliability. The validity of the scales was tested against a known weight 3 times. The difference among each measurement was insignificant, and the scales accurately measured the weight. Both scales were tested for reliability by having participants measure their weight 3 consecutive times. This was repeated on both scales with multiple participants. A *t* test was conducted to compare scores between the 2 scales. There was no significant difference between scores. Finally, the body composition scales were also measured against an air displacement plethysmograph (BOD POD) to check for accuracy. A one-way repeated measures analysis of variance (ANOVA) was conducted to compare scores between the 2 scale measurements and the BOD POD measurements. There was no significant difference between scores. Body fat measurements were measured by bioelectric impedance analysis using the OMRON devices to obtain body composition for the students.

Pilot study

A pilot study was conducted using 2 undergraduate Health Studies classes. The sample of students from these classes was similar to those in the main study. As a result of the pilot study, no changes were needed to the protocol or the survey instrument. The reliability of the BSS was measured during the pilot study. Cronbach's alpha coefficients were derived for each of the 3 sections of the BSS. The General Dissatisfaction Scale had an internal consistency of 0.954 ($n = 39$). The Head Dissatisfaction Scale had an internal consistency of 0.921 ($n = 40$). Finally, the Body Dissatisfaction Scale's internal consistency was 0.898 ($n = 42$).

Description of variables and analysis

The data were analyzed using descriptive analyses, *t* tests, chi-square, one-way ANOVAs, and linear regression. Descriptive statistics included frequency counts, measures of central tendency (averages), and measures of variability (standard deviations) to describe the study population. Chi-square was used to show whether there was a statistically significant relationship between categorical variables such as BMI categories by gender or race. One-way ANOVAs were run to compare BSS mean scores between groups with multiple categories, such as BMI categories. Finally, linear regression was conducted to determine which variables were related to measured BMI.

Results

The study population consisted of 515 students at a southern Louisiana university who were currently enrolled in undergraduate classes. The majority of the sample was female and was mostly Caucasian. Most of the students surveyed were freshmen (see Table 1).

Research question 1

Relationship between self-reported anthropometric measures and obtained anthropometric measures

According to BMI standards set by the CDC, the students were placed into BMI categories based on measured data. Of the 510 students who were measured, 22 students were classified as underweight, 236 were normal weight, 146

Table 1. Demographic characteristics of the sample.

	n	%
Gender		
Male	165	32.0
Female	348	67.6
Race		
Caucasian	350	68.0
Black	132	25.6
Other	33	6.4
Grade Classification		
Freshman	306	59.4
Sophomore	15	2.9
Junior	64	12.4
Senior	127	24.7
Other	2	0.4
Age		
Mean	20.07	
Range	18–47	
Standard deviation	3.495	

were classified as overweight, and 106 were obese. Paired *t* tests were conducted to analyze the relationships between self-reported and measured body weight, height, and calculated BMI scores. For weight, there was no significant difference between the students' reported body weights and their measured body weights. The results indicated that measured and reported weights were very highly correlated, $r(507) = 0.991$, $P < .000$. For reported height and measured height, the 2 measurements were found to be strongly correlated, $r(509) = 0.96$, $P < .001$. However, there was a significant difference in measurements between reported height ($M = 66.05$) and measured height ($M = 65.79$), $t(510) = 5.179$, $P < .001$, showing that participants tended to overestimate their height. Finally, BMI was calculated with both the measured data (height and weight) and the reported data (height and weight). Both BMIs were found to be strongly correlated, $r(503) = 0.97$, $P < .001$, but a significant difference was found between BMI scores calculated from self-reported data ($M = 25.87$) and measured BMI scores ($M = 26.05$), $t(505) = -2.84$, $P = .005$.

Correlation was used to examine the relationship between BMI and measured percentage body fat for the whole sample and also by gender. BMI and percentage body fat were shown to be moderately correlated overall, $r(513) = 0.69$, $P < .001$, and by gender. Correlations separated by gender are shown in Table 2. Analysis was conducted between measured weight and percentage body fat, and the 2 were found to also be moderately correlated, $r(513) = 0.41$, $P < .001$. A *t* test found a difference in body fat by gender, $t(511) = 16.06$, $P = .01$. This was an expected finding because of the typical distribution of body fat in men versus women (males: $M = 22.89$, SD $= 8.47$; females: $M = 36.60$, SD $= 9.29$). However, there was no difference in measured BMI by gender.

Table 2. Correlation of BMI and body fat by gender.[a]

	n	Mean	SD	r^2	P
Females					
Measured BMI	348	25.73	6.45	.913	.01
Measured body fat %	348	36.60	9.29		
Males					
Measured BMI	165	26.69	5.07	.88	.01
Measured body fat %	165	22.89	8.47		

[a] BMI indicates body mass index.

A one-way ANOVA, conducted to compare BMI and body fat measurements by race, found no difference. However, there were significant differences in body fat between whites ($M = 31.19$) and blacks ($M = 34.36$), $F(4,510) = 3.32$, $P = .011$. There were no other relationships among any of the other races.

Research question 2
Relationship between BMI and BSS scores

A measured BMI score was calculated with the students' measured height and weight scores. A weak positive correlation was found between measured BMI and general BSS scores, $r(475) = 0.09$, $P = .042$. A similar weak positive relationship was found between reported BMI (calculated from reported height and weight) and general BSS score, $r(467) = 0.09$, $P = .044$. Therefore, in general, as BMI increased so did body dissatisfaction.

When divided by BMI categories based on CDC standards (underweight, normal weight, overweight, obese), a one-way ANOVA showed that there was no significant relationship between BMI groups and BSS scores (general and head). This was true for both reported and measured BMI. Although not significant, the BSS general scores were typically higher in overweight people.

A significant difference was found between BMI categories and BSS score on the body section (measured BMI: $F(1, 3) = 7.720$, $P < .001$; reported BMI: $F(1, 3) = 8.657$, $P < .001$). A post hoc Tukey's test identified a significant difference in body BSS scores between obese individuals ($M = 24.95$) and those who were normal weight ($M = 19.84$) and underweight ($M = 17.77$). A similar relationship was found with reported data, where obese students ($M = 25.35$) had a significantly different body BSS than underweight students ($M = 17.95$) and normal-weight students ($M = 19.77$). Although mean body BSS scores were considered significantly higher for obese individuals, it is important to note that these scores (measured obese: $M = 24.95$; reported obese: $M = 25.35$) are still interpreted as somewhat satisfied on the BSS body scale.

Research question 3

BMI and health behaviors

One-way ANOVAs were conducted to identify significant relationships between certain demographics, health

Table 3. Relationship between measured BMI and grade classification.[a]

Variable	n	Mean	SD
Freshman*	306	25.35	5.93
Sophomore	15	26.32	6.67
Junior	64	25.86	5.23
Senior*	127	27.77	6.34
Other	2	31.12	8.40

[a] BMI indicates body mass index.
*Indicates significance at the .003 level.

behaviors, and measured BMI. A significant difference was found in grade classification, with a post hoc Tukey's test showing that seniors had a significantly higher BMI than freshmen, $F(4, 509) = 4.039$, $P = .003$. In general, BMI scores increased by grade classification (see Table 3). Further, age and measured BMI were found to be weakly correlated, $r(511) = 0.13$, $P = .003$.

Smoking cigarettes was also found to have a significant relationship with measured BMI. The results of a *t* test showed a significant effect for smoking with measured BMI, $t(510) = 2.31$, $P = .021$. Those who smoked had a significantly higher measured BMI ($M = 27.67$) than those who were nonsmokers ($M = 25.82$).

Additional one-way ANOVAs were conducted between measured BMI and other health behaviors. Initially, statistics were conducted on uncondensed variables for each behavior. Further tests were conducted on condensed versions of each variable. Diet soda consumption, eating at the student union, number of hours watching TV during the weekday, worrying about weight, and weight perception ("How would you describe your weight?") were found to have significant relationships with BMI. Behaviors not found to have a significant relationship with BMI included eating fruit and vegetables and number of days of exercising. Additionally, hours spent watching TV on the weekend and playing video games had no relationship to BMI.

An ANOVA was conducted to determine relationships between the variable "drinking diet soda." The 7-level variable "drinking soda" was condensed to 3 levels (*did not*, *less than 1 × /day*, *1 or more times/day*). At 3 levels, there was a significant difference in measured BMI and drinking diet soda, $F(2,510) = 6.57$, $P = .002$. Students who did not drink diet soda ($M = 25.66$) had a significantly lower BMI than those who drank it up to 6 times a week ($M = 28.34$).

Another variable, "eating at the student union," was classified as eating at one of several fast food restaurants in the student union and not in the school cafeteria located in the same building. Using the variable eating at the student union, a one-way ANOVA was conducted at 4 levels of variables (*did not eat at this place*, *1–3 times*, *4–6 times*, *7 + times*). A significant relationship with measured BMI was found, $F(3, 509) = 3.83$, $P = .010$. A post hoc Tukey's test showed a significant difference in BMI between those who did not eat at the student union ($M = 27.10$) and those who ate there 1 to 3 times a week ($M = 25.63$).

Another variable, "amount of time spent watching TV on a weekday," was found to have a significant relationship with BMI with the 7-level variable (*none*, *less than 1 hour/day*, *1 hour/day*, *2 hours/day*, *3 hours/day*, *4 hours/day*, *5 + hours/day*). The significant difference in BMI revealed by the post hoc Tukey's test was between those students who watched TV less than 1 hour a day and those who watched TV for 3 hours a day, $F(6,506) = 2.23$, $P = .039$. It was interesting to note that those who watched TV for 3 hours a day were shown to have a significantly higher measured BMI ($M = 27.77$) than those who watched it for less than 1 hour a day ($M = 24.46$).

In addition, stress eating was found to have a significant relationship to BMI, $F(2, 512) = 9.98$, $P < .001$. The variable levels (*eat more*, *eat less*, *no change*) were not condensed. A post hoc Tukey's test determined that students who reported eating more when stressed ($M = 27.82$) had a significantly higher BMI score than those who reported eating less when stressed ($M = 25.22$) and those whose eating habits did not change when stressed ($M = 25.36$).

A one-way ANOVA determined that the effect of worrying about weight on BMI was significant, $F(4, 499) = 22.88$, $P < .001$. A post hoc Tukey's test revealed several significant differences between mean BMI scores and levels of worry (see Table 4). Most noticeab,

Table 4. Relationship between BMI and worrying about weight.[a]

Variable	n	Mean BMI	Mean Differences Between BMI
Never	63	22.49	
Almost never			− 1.40
Sometimes*			− 2.92*
Often*			− 4.74*
Always*			− 7.96*
Almost never	67	23.89	
Never			1.40
Sometimes			− 1.52
Often*			− 3.34*
Always*			− 6.55*
Sometimes	180	25.41	
Never*			2.92*
Almost never			1.50
Often*			− 1.82*
Always*			− 5.03*
Often	123	27.23	
Never*			4.74*
Almost never*			3.34*
Sometimes*			1.82*
Always*			− 3.21*
Always	71	30.45	
Never*			7.96*
Almost never*			6.55*
Sometimes*			5.03*
Often*			3.21*

[a] BMI indicates body mass index.
*Indicates significance at the .05 level.

those students who reported "always" worrying about their weight had a significantly higher BMI score than any other group. Additionally, the "always worrying" student group was the only group to have a mean BMI score that is classified in the obese category ($M = 30.45$).

A one-way ANOVA analyzed possible relationships between BMI and weight perception ("How would you describe your weight?"). The analysis was conducted at 5 levels (*very under*, *slightly under*, *about right*, *slightly over*, *very over*) and showed statistical significance, $F(4,507) = 149.79$, $P < .001$. A post hoc Tukey's test identified differences between levels of the "describe weight" variable (see Table 5). It is notable that the group that perceived themselves as being very overweight was significantly different from all of the other groups and was the only group that had a mean BMI score in the obese category, which according to CDC is a BMI score of 30.0 or greater.

Multiple linear regression was used to determine which variables predicted BMI. The best model was selected based on significance levels for correlating variables. Several models were eliminated that included nonsignificant variables. Initially, smoking status, drinking status, gender, grade classification, race, eating breakfast, stress eating, days of 30 minutes of physical activity, weight perception ("How would you describe your weight?"), and worrying about weight were included in the analysis. The final model is depicted in Table 6 and includes gender, grade classification, weight perception ("How would you describe your weight?"), and worrying about weight as variables related to BMI. With these 4 variables in the regression analyses (gender, grade, describing weight [weight perception], and worrying about weight), 55% of BMI could be predicted.

Table 5. Relationship between BMI and weight perception.[a]

Variable	n	Mean BMI	Mean Differences Between BMI
Very under	6	20.92	
Slightly under			0.67
About right			− 2.20
Slightly over*			− 7.34*
Very over*			− 15.27*
Slightly under	40	20.24	
Very under			− 0.67
About right*			− 2.88*
Slightly over*			− 8.02*
Very over*			− 15.94*
About right	236	23.12	
Very under			2.20
Slightly under*			2.88*
Slightly over*			− 5.14*
Very over*			− 13.06*
Slightly over	178	28.26	
Very under*			7.34*
Slightly under*			8.02*
About right*			5.13*
Very over*			− 7.92*
Very over	52	36.18	
Very under*			15.27*
Slightly under*			15.94*
About right*			13.06*
Slightly over*			7.92*

[a] BMI indicates body mass index.
*Indicates significance at the .05 level.

Table 6. Multiple regression between measured BMI and health demographics/behaviors.

Variable	n	B	SE	t	P
Gender	495	2.35	0.406	5.83	.000
Grade	495	0.51	0.137	3.70	.000
Describe weight	495	4.74	0.247	19.20	.000
Worry weight	495	0.63	0.176	3.60	.000

[a] BMI indicates body mass index.

Research question 4

Perceived body weight and health behaviors

The question, "How would you describe your weight?" was used to assess students' weight perceptions. Weight perception and various health behaviors were analyzed through chi-square analyses. The health behavior variables were condensed to either 2 or 3 levels. The variables for describing weight were condensed from 5 levels (*very under*, *slightly under*, *about right*, *slightly over*, and *very over*) to 3: underweight, about right, and overweight. The variables very under and slightly under were combined to create underweight. The variables slightly over and very over were combined to create overweight. Several health behaviors were found to have a significant relationship with weight perception.

In general, those who classified themselves about right (75%, $n = 174$) and overweight (66%, $n = 152$) were more likely to eat healthy snacks. For students in the underweight category, only 56% reported consumption of healthy snacks. Eating fruit was common in all weight categories, with those who reported about right having the most students in the "yes" category (91%, $n = 212$). Drinking diet soda was less common in the student population but still had a statistically significant relationship with weight perception. More individuals who were overweight (22%, $n = 51$) reported drinking diet sodas than those who were underweight or about right (see Table 7).

Additional analyses were conducted with health behaviors related to daily inactivity. For the variable "hours sitting during the weekday," a large number of students reported sitting for 5 to 6 hours a day on average. However, underweight students (39%, $n = 18$) and overweight students (32%, $n = 74$) were more likely to report sitting 7 or more hours a day. In comparison, students who viewed their weight as about right

Table 7. Relationship between weight perception and dietary behaviors.

Behavior−Weight Perception	No % (*n*)	Yes % (*n*)	Statistic
Eating healthy snacks			$\chi^2(2, n = 512) = 6.68, P = .035$
Underweight	44 (20)	56 (26)	
About right	26 (62)	74 (174)	
Overweight	34 (78)	66 (152)	
Eating fruit			$\chi^2(2, n = 510) = 7.80, P = .020$
Underweight	24 (11)	76 (35)	
About right	9 (22)	91 (212)	
Overweight	12 (27)	88 (203)	
Drinking diet soda			$\chi^2(2, n = 510) = 17.15, P < .001$
Underweight	98 (45)	2 (1)	
About right	89 (208)	11 (27)	
Overweight	78 (178)	22 (51)	

(32%, $n = 75$) were more likely to report only sitting zero to 4 hours a day. For the variable "hours sitting during the weekend," students who reported as underweight (40%, $n = 18$) and overweight (37%, $n = 80$) were more likely to report sitting 7 hours, compared to those who considered themselves about right; the latter group of students were more likely to sit for only zero to 4 hours (40%, $n = 97$). Finally, the vast majority of students reported sleeping 7 or more hours each night on the weekend. However, it is concerning that 13% ($n = 6$) of underweight students reported getting 4 or less hours of sleep a night and that 26% ($n = 59$) of overweight students only reported getting 5 to 6 hours of sleep a night (see Table 8).

Other behaviors that showed a significant relationship with weight perception included number of days with 30 or more minutes of physical activity, the number of hours watching TV on the weekend, and how being stressed affected their eating habits. For the variable days of physical activity with 30 or more minutes, students reporting as underweight were more likely to exercise 1 to 3 days a week (50%, $n = 23$), and students who perceived themselves as about right (62%, $n = 145$) and overweight (47%, $n = 107$) were more likely to exercise 4 to 7 days a week. Students who classified themselves as underweight were also more likely to eat less when stressed (46%, $n = 21$) or experience no change in eating behavior (46%, $n = 21$). Students who thought of themselves as being about right also were more likely to eat less when stressed (43%, $n = 101$) whereas students who said they were overweight were more likely to eat more when stressed (44%, $n = 102$). Watching TV on the weekend also had a significant relationship with weight perception; underweight students watched zero to 2 hours (41%, $n = 18$) or 3 or more hours (43%, $n = 19$) of TV on the weekend. Students who considered themselves about right reported watching only up to 2 hours of TV on the weekend (54%, $n = 122$), but many of the students who were overweight watched 3 or more hours of TV on the weekend (48%, $n = 104$; see Table 9).

Weight perception and BSS score

A one-way ANOVA was conducted on the 3-level weight perception variable (underweight, about right, overweight) and the BSS. For the general BSS, a significant difference in BSS scores by weight perception was found, $F(2, 473) = 5.04$, $P = .007$. Those who reported being about right ($M = 39.23$) and those who thought of themselves as being overweight ($M = 45.28$) had significantly different mean scores on the general BSS scales. For the BSS body subscale, a significant difference was found in BSS scores, $F(2, 492) = 17.80$, $P < .001$, between those who were overweight ($M = 24.35$) and underweight ($M = 18.49$) and those who were overweight ($M = 24.35$) and about right ($M = 19.30$).

Table 8. Relationship between weight perception and inactivity.

Behavior−Weight Perception	0−4 Hours % (*n*)	5−6 Hours % (*n*)	7 + Hours % (*n*)	Statistic
Hours sitting weekday				$\chi^2(4, n = 510) = 10.45, P < .034$
Underweight	20 (9)	41 (19)	39 (18)	
About right	32 (75)	46 (109)	22 (51)	
Overweight	25 (58)	43 (97)	32 (74)	
Hours sitting weekend				$\chi^2(4, n = 488) = 13.58, P = .009$
Underweight	24 (11)	36 (16)	40 (18)	
About right	40 (91)	37 (84)	23 (52)	
Overweight	33 (72)	30 (64)	37 (80)	
Hours sleeping weekend				$\chi^2(4, n = 508) = 10.16, P = .038$
Underweight	13 (6)	17 (8)	70 (32)	
About right	4 (9)	24 (57)	72 (167)	
Overweight	3 (7)	26 (59)	71 (163)	

Table 9. Relationship between weight perception and other health behaviors.

Behavior – Weight Perception				Statistic
Days with 30 + minutes physical activity	0 days % (*n*)	1–3 days % (*n*)	4–7 days % (*n*)	$\chi^2(4, n = 510) = 13.64, P = .009$
Underweight	9 (4)	50 (23)	41 (19)	
About right	4 (10)	34 (80)	62 (145)	
Overweight	6 (14)	47 (108)	47 (107)	
Stress eating	Eating More % (*n*)	Eating Less % (*n*)	No Change % (*n*)	$\chi^2(4, n = 512) = 40.53, P < .001$
Underweight	8 (4)	46 (21)	46 (21)	
About right	21 (51)	43 (101)	36 (84)	
Overweight	44 (102)	32 (73)	24 (55)	
Hours of TV/weekend	None % (*n*)	0–2 hours % (*n*)	3 + hours % (*n*)	$\chi^2(4, n = 484) = 14.32, P = .006$
Underweight	16 (7)	41 (18)	43 (19)	
About right	10 (22)	54 (122)	36 (81)	
Overweight	15 (32)	37 (79)	48 (104)	

In general, as the students' weight perception increased, there was an increase in mean scores for the body BSS.

Discussion

The current study's purpose was to identify relationships among perceived weight, actual weight, health behaviors, and body satisfaction. The study examined relationships between self-reported and measured anthropometric items and analyzed the association between BMI and body satisfaction as measured by the BSS. Additionally, we looked for connections between BMI and health behaviors, such as eating and exercise habits. Finally, the study aimed to assess the relationship between perceived body weight and selected health behaviors.

Students were able to accurately report their weight but did not accurately report their height. They tended to overestimate their height. Overall, BMI and percentage body fat were shown to be moderately correlated, indicating that in general the students' BMI scores reflected body composition. There was not a significant difference in measured BMI by gender. The average BMI for female students was 25.73 and the average BMI for male students was 26.70. However, both of these BMI measurements are considered overweight based on the CDC's BMI categories.[7] In general, implementing a series of weight loss interventions at this university might benefit the students.

There was a weak positive correlation between BMI and BSS scores. As BMI increased, students' scores on the BSS also increased. Increasing scores on the BSS show less body satisfaction. However, it is important to note that mean score on the general BSS scale for all students was 42.04 and 45.89 for obese students. This still indicates some degree of positive body satisfaction. As seen in a 2012 study, lower weight individuals tended to have a higher sense of positive body image.[35] In the aforementioned study, the mean BMI of participating students was 20.13 (normal weight) and 83.88% of participants rated their body image as good to excellent. In the current study, the mean BMI was 25.73 for females and 26.70 for males, and the mean score on the BSS was 42.04. Even though the students in the current study were more overweight than the Goswami et al.[35] study, the majority of students reported being satisfied.

Grade classification and smoking status were shown to have a significant relationship with BMI. Seniors had significantly higher BMI scores compared to freshmen. Smoking was also associated with a significantly higher BMI. As such, interventions targeted toward younger students about healthy weight maintenance and smoking/tobacco cessation would be appropriate for use at this university and perhaps other universities. Additionally, the university at which this study was conducted was currently undergoing dramatic efforts to reduce smoking/tobacco use among students through initiating a tobacco-free campus. Future studies should continue to monitor student smoking status in order to show how tobacco-free campus regulations are affecting student health.

The number of hours spent watching TV during the work week also had a significant relationship to BMI. Students who watched 3 hours of TV a day during the week had a higher mean BMI than those who watched less than 1 hour of TV a day. Maher et al.[14] and Duncan et al.[15] both have shown that higher amounts of screen time are linked to obesity. In fact, Duncan et al.[15] found that a higher amount of screen time (21 hours or more a week) was associated with an increased likelihood of being obese, regardless of physical activity. This is concerning regarding the current study, because students who watched 3 hours of TV a day could easily watch a minimum of 15 hours of TV a week, without including time watching TV on the weekends or screen time not involving a TV (i.e., using a computer, tablet, or phone). When taking into consideration the prevalence of technology utilized for leisure and in today's classrooms, it would not be surprising if the total amount of real screen time a student was engaged easily exceeded 21 hours per week. An appropriate solution to this would be to integrate more teaching methods using less technology into the current curriculum. Use of methods such as group work and discussion would result in a decrease of technology use in classrooms. It would also stimulate social learning in the classroom, as well as increase students' comfort level with their peers.

Some dietary behaviors also had significant relationships with BMI. Drinking diet soda, eating at the student union, and stress eating were the only health behaviors to show relationships to BMI. Additionally, students who did not drink diet soda had a significantly lower BMI than those who drank it up to 6 times a week. The authors speculate that drinking diet soda moderately could be used as compensation for the consumption of more calorie-dense food or be used to lose weight. This may explain why higher BMI scores were found in students who drank more diet soda than those who did not drink it at all. Furthermore, students who ate more when stressed were more likely to have a higher BMI. Stress eating, in particular, has been associated with negative health behaviors such as binge eating, lack of diet control, and engaging in heavy exercise in both genders.[12]

Though not significant, it is still interesting to note some additional dietary behaviors of the students in this study. For example, 67% of students reported eating fruit less than once a day. There were similar frequencies for vegetable consumption, with 83% of students eating green vegetables less than once a day and 71% of students eating other vegetables less than once a day. Roughly 22% of students reported drinking regular soda at least once a day, and 53% of students ate breakfast 4 or fewer days of the week. Eating breakfast consistently during the week has been correlated with a lower weight, waist circumference, and BMI.[10] Additionally, Esmaillzadeh and Azadbakht found that diets high in fruits, vegetables, tomatoes, poultry, legumes, and whole grains resulted in lower BMI scores, smaller waist circumference measurements, and lower waist-to-hip ratios.[36] A Thai study showed that participants who consumed sugar-sweetened beverages at a higher frequency were more likely to have a greater weight gain across all age groups studied, regardless of gender.[13] Therefore, it is clear that the students at this university are not participating in behaviors conducive to maintaining a healthy weight. It is recommended that this university implement programs that would have a focus on improving healthy eating behaviors.

Gender, grade classification, weight perception, and worrying about weight were shown to be associated with BMI. In a multiple regression analysis, gender was related to BMI. Grade classification was shown to be associated with BMI, because seniors had significantly higher BMI measurements than freshmen. Worrying about weight had a significant relationship with BMI, where those who selected "always worrying about weight" were the only group to have BMI in the obese category. Finally, there were significant relationships between BMI and weight perception. Analysis showed that the group that perceived themselves as being "very overweight" had a significantly higher BMI score than all of the other groups and was the only group with a mean BMI score in the obese category.

The results of a 2011 study showed that there was a significant difference among actual and perceived BMI among adolescent students.[37] This study showed similar results, because there was a significant, although small, difference in scores between measured and reported BMI, even though the measurements were highly correlated. This could be due to the large number of subjects. The analysis showed that subjects could have overestimated their height, because reported and measured height were highly correlated but also had a small, yet significant, mean difference. This could have affected the reported BMI.

Students in the current study were able to accurately report their weight. Additionally, students with higher BMI scores worried more about their weight and perceived themselves to be more overweight. Similarly, students who had lower BMI measurements were less concerned with their weight and had a more accurate perception of their own body type. To this effect, the students in this study seemed to accurately perceive their own weight and were correspondingly more worried about their weight if they were heavier. Both Alwan et al.[27] and Barrett and Huffman[37] found that a substantial number of students inaccurately perceived their weight status. In the current study, the students did not underestimate their weight and had an accurate perception of their weight. Additionally, it seems that for this study, the discrepancy in BMI scores was not caused by a mismatch in weight but rather that the students did not accurately represent their height.

Because the students did have accurate perceptions about their weight and were correspondingly worried about their weight, this may assist them in taking steps to change their health behaviors related to eating and physical activity. Colleges and universities should take steps to implement a variety of interventions geared toward weight loss and healthy living. Student support and accountability groups, additional weight loss programs, and innovative new technology (such as applications and interactive websites) could all aid students in achieving a healthy lifestyle.

Regarding study limitations, the first was that subjects were selected though convenience sampling. This may have limited variation in responses and may restrict application of findings to other populations. Approximately half of the subjects were recruited from the

Department of Kinesiology and Health Studies. These students may have had additional body and general health awareness due to their major, which may have skewed responses regarding anthropometrics and health behaviors. Additionally, the scales used for this study could only weigh students up to 320 pounds. The data for 6 students had to be excluded for this reason. Thus, findings may be less applicable to other populations due to these limitations. In addition, though reliability measurements were run on both body composition scales utilized in the study, there could have been minor variations in measurements between scales. The current findings are important and applicable to this university but may not be generalizable to other universities. Other limitations are that incidence and temporality could not be determined.

For future studies, it would be beneficial to ask more detailed questions about individual health behaviors. Separate surveys with more detailed questions for each type of health behavior would be recommended and may lead to more significant results. For example, a survey that focuses singularly on dietary behaviors (such as fruit and vegetable consumption) could better assess the eating patterns of students than the general survey utilized in the current study. Moreover, added emphasis should be spent on identifying gender behavioral differences. The current study showed that gender had a significant relationship to BMI, so additional focus could be used to analyze health behaviors of each gender. Another potential item of interest for future studies would be the effect of grade classification on health behavior, because this study showed that seniors had significantly higher BMI scores than freshmen. Additionally, it would be interesting to add in a qualitative component to gain more in-depth information about student body image and body satisfaction.

Translation to Health Education Practice

With over one third of adult Americans and 17% of American youth classified as obese, it is important to study the health behaviors of not only adults but also children and adolescents.[1,7] Additionally, it is important to monitor all of the dimensions of health, because each dimension impacts an individual's overall health, including one's physical, mental, and social well-being. As such, body satisfaction is an important part of an individual's body image and mental health. Having a negative body perception has been linked to lower self-esteem, less life satisfaction, and feelings of inferiority.[35]

The current study found that students' BMI was related to gender, grade classification, weight perception, and how much they worried about their weight. Because seniors had significantly higher BMI scores than underclassmen, it is imperative that incoming students be taught fundamental skills to enable a healthy lifestyle. Educational interventions implemented in freshman year could lead to a decrease in overall BMI. Classes or seminars focusing on basic nutrition and physical activity would benefit students by increasing their knowledge about positive health behaviors and potentially decrease their participation in negative health behaviors. Classes could also focus on body image and the importance of maintaining not only physical health but mental well-being. For example, even something as simple as opening each freshman orientation class with a health topic could be beneficial to students and could also be easily integrated into an existing curriculum.

Additionally, technology should be utilized appropriately to engage students in healthy behaviors. The amount of technology utilized in classrooms settings should decrease or be used in ways to incorporate mental and physical participation in the classroom. However, technology use could also benefit students outside of the classroom with applications and websites dedicated to healthy habits. With the appropriate incorporation of technology in the classroom and throughout the university, students could learn how to live a healthy lifestyle while still engaging in a modern-age curriculum.

In conclusion, it is important to monitor a variety of health behaviors in a university student population, including health demographics and body satisfaction. This would allow researchers and Health Educators to accurately identify health behaviors of each group by demographics. Further, this would help to determine what actions should be taken to lead to a healthier, happier student body.

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