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## Impact of Nutrition Knowledge and Body Image on BMI Assessment in College-Aged Men and Women

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Madeline Simonet

Manuscript

Impact of Nutrition Knowledge and Body Image on BMI Assessment in College-Aged Men and Women

## **Background**

A majority of the population struggles with body image everyday. However, college students/young adults seem to struggle the most. In a recent Psychology Today Body Image Survey, 56% of college-aged women and 43% of college-aged men were dissatisfied with their overall appearance.

## **Objective**

To assess how accurate college-aged males and females are in estimating own body images by measuring perceived vs. actual BMI and to analyze if a participant's nutritional background knowledge affects the accuracy of BMI prediction.

## **Methods**

One time data collection was used. Participants (n=23 female, n=17 male) estimated BMI via silhouette choice. After BMI estimation, participant height and weight were collected to determine actual BMI and compare to perceived BMI to determine accuracy. Participants also completed two body image assessment surveys and a nutrition knowledge questionnaire. Results of survey and questionnaire were used to investigate influences on BMI estimation accuracy.

## **Results**

Females were more accurate in predicting actual BMI ( $-0.7 \pm 2.6$ ) than males ( $1.6 \pm 3.6$ ) ( $p=0.014$ ). A total of 12 females underestimated BMI, while 11 female overestimated BMI (n=23). A total of 12 males underestimated BMI, while 5 overestimated BMI (n=16). Males had significantly higher average actual BMI ( $25.5 \pm 5.1$  kg/m<sup>2</sup>) than females ( $22.4 \pm 2.8$  kg/m<sup>2</sup>) ( $p=0.018$ ). Fourth years significantly underestimated BMI ( $-0.71 \pm 2.1$ ) while third years ( $1.9 \pm 4.8$ ), second years ( $0.6 \pm 2.6$ ), and first years ( $1.9 \pm 3.4$ ) significantly overestimated BMI ( $p=0.047$ ). Body Shape Questionnaire scores and Body Appreciation Scale scores did not differ by General Nutrition Knowledge Questionnaire performance.

## **Conclusions**

Some recognized themes from the data suggest that undergraduate females were more accurate in predicting their BMI than undergraduate males. Fourth years significantly underestimated BMI while third years, second years, and first years significantly overestimated BMI. BSQ scores and BAS scores did not differ by GNKQ performance. These results provide an opportunity of awareness to enforce positive body image in young adults.

## **Introduction:**

Body image is an issue that has been negatively affecting Americans for decades. Out of all age groups, young adults/college students struggle most with body image (1, 316). College students are surrounded by peers of a similar age each day and comparison is inevitable (2, 288). The amount of stress that comes with being a college student can also contribute to a negative perception of one's body.

Diminished body image is mainly associated with women, but is becoming a problem for men as well. Negative body image has been on the rise in both genders due to the media's idea of the "perfect body" (3, 322). Public media, such as commercials and billboards, advertise people to look a certain way and almost always use skinny models to advertise clothing. Men strive for a muscular look whereas women desire the thin ideal, thigh gap, and bikini body stereotypes (1, 317). As a result, people think one must be exactly as the advertisements are, therefore, creating a negative body image.

Little is known about the relationship between nutrition knowledge and body satisfaction, particularly about the college-aged population. Linking the two could reveal an important interrelationship that could be addressed through educational interventions on college campuses (4, 283). The limited existing research is mainly observational, polling students about body image and potential influential factors. For example, college students from a large northeastern US university took an online survey that included a nutrition knowledge scale and body part satisfaction scale. Both males and females showed a significant positive correlation between nutrition knowledge and attitudes towards oneself (4, 285).

The objectives of this study were to assess the relationship between body image, nutrition knowledge, and BMI assessment in college students. BMI estimation accuracy was determined and compared to nutrition knowledge and body image survey results. The results are useful to better understand how college students view themselves and if there is a need to promote positive body image in young adults.

## **Methods:**

### **Recruitment and Study Design:**

Participants were recruited through mass email to the student body. The email consisted of a link to forms manager where students interested in participating in the study filled out email, gender, year in college, and major for research purposes. Participants were contacted individually in an email to set up a data collection appointment.

### **Participants:**

Participants (total n=40, women=23, men=17) ranged from 18-24 years old and were from the College of Saint Benedict and Saint John's University. Undergraduate students that previously had an eating disorder were excluded from

the study. Participants who completed the study were entered into a drawing to win one of two \$25 Target gift cards.

Procedures:

Individual appointments consisted of estimating BMI through BMI silhouettes, filling out two questionnaires, and collecting weight, height, and waist circumference to measure actual BMI. Participants were asked to sit down at a table and shown a piece of paper in which nine different BMIs were illustrated through different shaped body figures. Each body figure represented a different BMI unknown to the participant. The BMI scale categorizes normal BMI ranging from 18.5 to 24.9. The females were shown nine different BMI silhouettes and the males were shown nine different male silhouettes. The participant was asked to point to which silhouette best represented themselves.

The participant then took two questionnaires. The first questionnaire was the Body Image Survey, which consisted of 16 questions. Eight questions were pulled from the Body Shape Questionnaire (BSQ) and eight questions were pulled from Body Appreciation Scale (BAS), both of which were validated questionnaires. These questions asked the participant on a scale of always (1) to never (5) on their feelings towards their bodies. The BSQ assessed body dissatisfaction, so the higher the score the more frequent body dissatisfaction. For example, a score of 32 or higher meant frequent body dissatisfaction, a score between 24-31 meant some body dissatisfaction, a score of 16-23 meant mild body dissatisfaction, and a score of <15 meant minimal body dissatisfaction. The BAS assessed body appreciation, so the higher the score the greater the body appreciation. For example, a score of 32 or higher meant frequent body appreciation, a score between 24-31 meant some body appreciation, a score of 16-23 meant mild body appreciation, and a score of <15 meant minimal body appreciation. The second questionnaire the participants were asked to complete was the General Nutrition Knowledge Questionnaire (GNKQ), which was a validated tool to assess nutrition knowledge. The students took a shortened version of the questionnaire. The sections consisted of what advice participant experts are giving them, questions on classifying food into groups, questions about choosing foods to eat, and questions about health problems or diseases related to diet and weight management.

Lastly, the participant was asked to take anthropometric measurements of weight and height. Weight was measured with a portable scale in pounds. Height was measured with a stadiometer in inches. Actual BMI was calculated by dividing body weight (lbs.) by height squared (in. <sup>2</sup>) and multiplying by a conversion factor of 703. Averages and standard deviations were calculated to compare differences. Actual BMI and estimated BMI were compared to see how accurate the participant was in predicting their own BMI. A t-test and ANOVA test were used during statistical analysis.

## **Results:**

Academic year and gender of participants varied (Table 1) with a total sample size of 40 participants (57% females, 43% males; Table 1) All participants were between the ages of 18-24 years old, attended the College of Saint Benedict or Saint John's University, and have never been diagnosed with an eating disorder.

Table 1. Number of male and female participants in each academic year out of a total of 40 participants

Gender	Freshmen	Sophomore	Junior	Senior	Total
Female	7	4	4	8	23
Male	5	2	2	8	17
Total	12	6	6	16	40

The average actual BMI vs. the average perceived BMI in both male and female participants is shown in Table 2. The ANOVA analysis demonstrated males had a significantly higher BMI ( $25.5 \pm 5.1 \text{ kg/m}^2$ ) than females ( $22.4 \pm 2.8 \text{ kg/m}^2$ ) ( $p=0.018$ ) (Table 2). Both male and female participants fell into the normal BMI range for perceived BMI ( $22.5 \pm 2.6 \text{ kg/m}^2$ ;  $23.8 \pm 2.0 \text{ kg/m}^2$ ), however males average BMI was in the overweight BMI range and females average BMI was in the normal BMI range for actual BMI ( $22.4 \pm 2.8 \text{ kg/m}^2$ ;  $25.5 \pm 5.1 \text{ kg/m}^2$ ) (Table 2).

Perceived BMI did not differ between genders. However, females were more accurate than males when estimating BMI. Males underestimated BMI ( $1.6 \pm 3.6 \text{ kg/m}^2$ ) while females overestimated BMI ( $-0.7 \pm 2.6 \text{ kg/m}^2$ ) ( $p= 0.014$ ) (Table 2). Since the female BMI accuracy was closer to zero ( $-0.7 \text{ kg/m}^2$ ) than the males ( $1.6 \text{ kg/m}^2$ ), the females were more accurate in estimating BMI.

Table 2. Average actual BMI vs. Average perceived BMI in females and males

	Female	Male	P-value
Average Actual BMI	$22.4 \pm 2.8$	$25.5 \pm 5.1$	0.018
Average Perceived BMI	$22.5 \pm 2.6$	$23.8 \pm 2.0$	0.078
Accuracy BMI	$-0.7 \pm 2.6$	$1.6 \pm 3.6$	0.014

Table 3 displays the relationship between Body Image Survey and gender. BAS and BSQ scores did not differ between genders. The average score for both females and males on the BSQ fell into the mild body dissatisfaction category (16-23 points). The average score for both males and females on the BAS fell into the frequent body appreciation category (32 points or higher).

Table 3. Relationship between the Body Image Survey and gender

	Female	Male	P value
BSQ Score	$21.3 \pm 6.3$	$18.1 \pm 6.2$	0.30
BAS Score	$33.6 \pm 5.2$	$33.9 \pm 3.8$	0.84

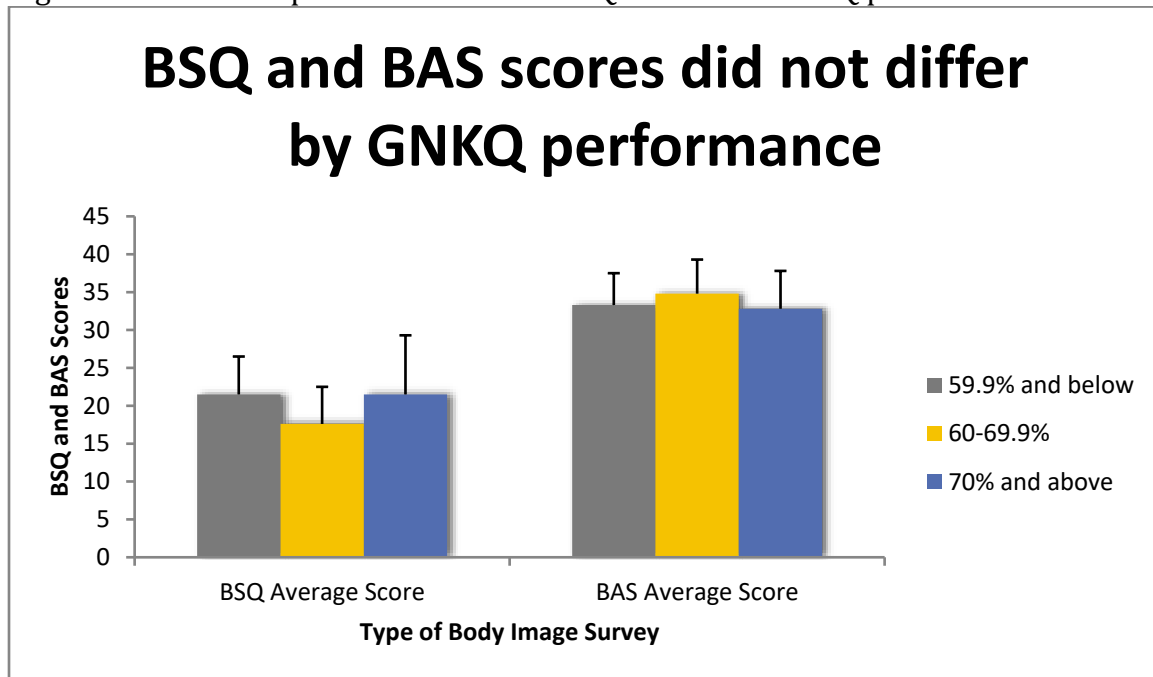
Table 4 shows the relationship between the Body Image Survey and academic year. There was no difference between the BSQ and the BAS and academic year. The ANOVA analysis demonstrated there was a significant association between the accuracy of predicting BMI and academic year ( $p=0.047$ ) (Table 4). Second years ( $0.6 \pm 2.6$ ) (Table 4) were the most accurate in predicting BMI as they had the average closest to zero. Fourth years tended to overestimate BMI ( $-0.71 \pm 2.1$ ) (Table 4), while third, second, and first years tended to underestimate BMI. Differences between academic year and actual BMI trended towards significance ( $p=0.053$ ) with third years averaging the highest BMI with ( $26.7 \pm 4.9 \text{ kg/m}^2$ ) (Table 4).

Table 4. Relationship between the Body Image Survey and academic year

	1st Year	2nd Year	3rd Year	4th Year	P value
BSQ Score	$19.8 \pm 5.6$	$18.7 \pm 3.0$	$21 \pm 6.9$	$20.1 \pm 6.4$	0.96
BAS Score	$34.3 \pm 4.6$	$35 \pm 2.3$	$32 \pm 7.1$	$33.5 \pm 4.3$	0.87
Accuracy BMI	$1.9 \pm 3.4$	$0.6 \pm 2.6$	$1.9 \pm 4.8$	$-0.71 \pm 2.1$	0.047
Actual BMI	$24.9 \pm 4.3$	$23.4 \pm 2.9$	$26.7 \pm 4.9$	$21.8 \pm 2.6$	0.053

In Figure 1, the BSQ and BAS scores did not differ by GNKQ performance. The grey bars on the graph represent the participants that received a score of 59.9% or lower on the GNKQ. The yellow bars on the graph represent the participants that received a score of 60-69.9% on the GNKQ. The blue bars on the graph represent the participants that received a score of 70% and above on the GNKQ. Overall, nutrition knowledge did not impact how the participant viewed him/herself due to the lack of significance ( $p=0.184$  for BSQ and  $p=0.493$  for BAS).

Figure 1. Relationship between BAS and BSQ scores and GNKQ performance



### **Discussion:**

While testing perceived vs. actual body image, a total of 12 females underestimated BMI, while 11 females overestimated BMI (n=23). A total of 12 males underestimated BMI, while 5 overestimated BMI (n=17). Males had a significantly higher average actual BMI ( $25.5 \pm 5.1$ ) than females ( $22.4 \pm 2.8$ ) ( $p=0.018$ ). Body image scores did not differ among gender. Fourth years significantly underestimated BMI ( $-0.71 \pm 2.1$ ), while third years ( $1.9 \pm 4.8$ ), second years ( $0.6 \pm 2.6$ ), and first years ( $1.9 \pm 3.4$ ) significantly overestimated BMI ( $p=0.047$ ). BSQ scores and BAS scores did not differ by GNKQ performance.

In this study, undergraduate females were more accurate in predicting BMI than undergraduate males. Half of the females underestimated BMI, while the other half overestimated BMI. This was surprising given that the majority of findings indicate that females are vastly more likely to overestimate BMI. This could be due to the fact that CSBSJU frequently promotes positive attitudes and body image. CSBSJU constantly has optimistic, motivational quotes and seminars for students to attend that could be a reason that many of CSBSJU student's body image is fairly positive. Other universities and institutions might not have the resources that CSBSJU has to promote such things. According to other studies, female undergraduate students in Kuwait chose a larger perceived body image than expected compared to actual BMI (5, 703). The trend continued in female undergraduate students in Louisiana where 63% of women perceived weight to be one category of weight higher than actual size (2, 296). This trend could be due to

the fact that media has such a powerful influence on body image. Media portrays women as having a thin, bikini body with a thigh gap. This ideal body type, as portrayed by social media, may make individuals self-conscious and dissatisfied with their own bodies.

Gender plays a large role in whether perceived BMI is accurate to actual BMI. Majority of findings proved males were more accurate in estimating perceived body image, however this study proved that females were more accurate in predicting perceived BMI. Around 55% of men were realistic in self-perception body size in the Louisiana study (2, 296). Male and female Jamaican adolescents compared self-perceived weight, desired weight, and actual BMI. Females had a higher difference in actual BMI as compared to perceived BMI. Additionally, the females had lower perceived BMI than males meaning males had a more accurate estimate in perceived body image (6, 270). Culture could have played a role in the Jamaican study. How one views the “perfect body” could be different in various parts of the world. Additionally, females had more positive body appreciation when participants took the BAS and BSQ body image surveys. This could explain why women were more accurate than men in estimating BMI.

Nutrition knowledge did not impact how one viewed oneself. However in other studies, the data showed that a positive correlation between high nutrition knowledge scores and attitude towards oneself is evident in both young adult male and females (4, 285). Additionally, having a more in depth background in nutrition can actually increase someone’s body image (7, e58543). Interpreting the interaction of nutrients and other substances in food in relation to growth, reproduction, health, and disease can enforce a more positive body image on an individual. Nutrition knowledge’s lack of impact on body image could be due to the fact that participants were from a wide range of majors, only a few participants having a degree in nutrition. It would be interesting to investigate if being a nutrition major or not affected how one scored on the GNKQ.

Seeing how people perceive their BMI vs. their actual BMI can be an eye opening experience. Analyzing perceived vs. actual BMI can raise awareness that sometimes the way people think they look isn’t always the truth. By analyzing the perceived BMI and comparing it to a participant’s actual BMI, the study can enforce positive body image in young adults; something that has been lacking for the past couple of decades. Additionally, not many measures of body image have been done on the CSBSJU campuses, which means there are hardly any studies to compare this study to that have been done at CSBSJU. This study can really give an insight as to how students on both campuses feel about their bodies. Since the results didn’t show an overwhelming negative body image for either males or females, the campus organization called Student Development doesn’t need to get involved. However, the study could be sent to the organization to show that CSBSJU has a fairly positive body image. Student Development is an organization on both campuses that provides opportunities for both young women and men to understand themselves as gendered people and to fully engage as reflective leaders in their community. It is unknown how many students utilize the organization.

Forty participants contributed to the study. A more reliable and accurate study would have a larger participant sample. Additionally, most of the participants



were Caucasian students. The ethnic distributions of the participants did not reflect the distributions of ethnicities within the United States, therefore limiting the generalizability of the results. If the study were to be duplicated, comparisons of race would be interesting to contrast. Another limitation was the female to male ratio (n=23 and n=17). The findings would have been accurate if an even amount of females and males participated in the study. Furthermore, the study was conducted at CSBSJU, a small, private, Midwestern school that does not reflect U.S. undergraduates as a whole. It would have been more accurate to travel to multiple Universities, both large and small and public and private, across the U.S. to see how body image and nutrition knowledge are related across the country.

Future studies should examine the BAS (Body Appreciation Scale) and BSQ (Body Shape Questionnaire) in terms on their influence on adaptive eating and prevention of harmful behaviors used in attempt to alter body shape (e.g., chronic dieting, vomiting after meals, skipping meals, and using laxatives). Given that internalization of the thin-ideal stereotype and societal pressures for thinness predict negative body image, prospective designs using the BAS and BSQ could determine whether women's rejection of the societal thin-ideal stereotype and other's acceptance of their body shape predict their future levels of body appreciation or dissatisfaction.

Overall, readers should be aware that negative body image is a growing problem in both males and females in today's society. However, CSBSJ students were more accurate in predicting BMI than originally thought. Compared to a vast majority of other findings, CSBSJU students have a fairly positive body image.

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