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Original Article

Perceived overweight/obesity, low resilience, and body size dissatisfaction among adolescents

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ABSTRACT

Objective: The obesity epidemic has been compounded by the stress of weight stigmatization. Resilience helps adolescents achieve positive outcomes during times of stress. This study aimed to determine relationships between overweight/obesity, perceived overweight/obesity, body size dissatisfaction (BSD), and/or resilience using a novel assessment tool among adolescents, and to determine if a modifiable factor such as resilience holds potential for treatments for BSD.
Methods: Adolescents, ages 13–21, were recruited from clinics at an academic medical center. Weight, height, demographic characteristics, BSD, and resilience were assessed via questionnaires and health records. A model of predictive variables for BSD was tested, and an adjusted analysis was performed using logistic regression.
Results: Eighty-five adolescents participated: 48% overweight/obese, 32% BSD, and 53% low resilience (LR). There was no association between actual and perceived overweight/obesity and LR (P = 0.386 and P = 0.123, respectively). Perceived overweight/obesity was five times (AOR 5.3; 95% CI = 1.6–14.5; P = 0.004) and LR was six times (AOR 6.4; 95% CI = 1.9–22.4; P = 0.003) more likely to be associated with BSD. The strongest sub-component of LR associated with BSD, was low confidence (OR 4.7; 95% CI = 1.4–15.2; P = 0.008).
Conclusions: LR and perceived overweight/obesity are independently associated with BSD. This finding is important because resilience can be improved, thus highlighting a need for future studies involving resilience building interventions to decrease BSD.

Introduction

Overweight and obesity are a significant public health concern, with approximately one-third of adolescents in the United States classified as overweight or obese [1–3]. Paralleling this concern, weight stigmatization and discrimination have become more prevalent in our society [4]. While weight stigma occurs in all weight categories, individuals with obesity are most commonly affected. Negative societal views that exist towards overweight and obesity, such as "fat is bad and thin is good," place adolescents in a vulnerable position [5,6]. The stress from weight discrimination has harmful effects on health [7–9], and is associated with high risk-behaviors, such as cigarette smoking, driving while intoxicated, risky sexual/drug use behaviors, and not using a seat belt [10]. Additionally, weight stigma can prompt coping behaviors such as binge eating, social isolation, depression, and avoidance of health care services [11]. The idealized "thin" promoted by society and health-care providers, can negatively impact one's view of body image and promote body size dissatisfaction (BSD) [12,13]. This led to the American Academy of Pediatrics [14] publishing a policy statement to help address and eliminate weight stigma.

BSD is an internal thought disturbance that can be influenced by external factors [15]. Protective factors are important during times of stress, that can be created by overweight/obesity and weight discrimination. The ability to bounce back is vital to healthy adolescent development. Resilience has been described as the protective factors that dynamically allow one to have a good outcome, overcoming stress and adversity, while sustaining normal psychological and physical functioning [16,17]. While it was previously challeng-

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ing to screen for resilience in adolescents in the outpatient setting, in 2017, Barger et al. [18] created and validated the "7Cs tool" to serve this function. This tool is based on Ginsburg's 7Cs Model of Positive Development [19]. The seven components that comprise resilience include: competence, confidence, connection, character, contribution, coping, and control.

Resilience may be important for combating overweight and obesity. A study by Skrove et al., found an association between perceived body mass in boys and resilience factors, including social competence, family cohesion, and loneliness [20]. The authors suggested that in boys, resilience factors might protect them from the risk of perceiving oneself as obese or thin. Barger et al. found that adolescents who identified as ever having a problem with their weight, such as underweight, overweight, anorexia, and bulimia, had decreased confidence; but no other components of resilience were identified as significant [18]. We hypothesized that adolescents with BSD have low resilience. The purpose of this study is to determine if a modifiable factor such as resilience holds potential for treatments for BSD and possible eating disorders.

Subjects, materials and methods

Participants were recruited from three general pediatrics and two adolescent medicine academic medical center clinics in New Jersey. One of the pediatric clinics and one of the adolescent medicine clinics were located in an urban, underserved setting. The other participating clinics were in nearby suburban towns. These clinics serve a wide range of adolescents representing a diverse population with regard to socio-demographics, health status, educational attainment and risk behaviors. These were the same settings from which adolescents were enrolled to validate the resilience score described below. The subjects were mainly well adolescents, and drawn from a population that was convenient for the principal investigator, as a medical student.

Subjects thirteen to twenty-one years of age were invited to participate. Both subjects and their parents or guardians, if the subject was a minor, were required to speak and read English at the seventh-grade level in order to provide informed consent and assent. Patients who were pregnant, or wards of the state or any other agency were excluded. This study was approved by the Cooper University Hospital Institutional Review Board.

Adolescents completed two forms independently, without the help of their parent(s) or guardian(s): the 7Cs tool [18] and the Contour Drawing Rating Scale [21]. The 7Cs tool [18] is comprised of seven-questions, each with three possible answers. The tool was tested for validity and reliability; the Cronbach's alpha was consistent at 0.7. Barger et al. found lower resilience on the 7Cs tool correlated with higher adverse childhood events and Health Survey for Adolescents score. The 7Cs tool assessed seven qualities of resilience: competence, confidence, character, connection, caring, coping, and control. The score ranges from zero to fourteen and each of its sub-components range from zero to two; higher scores correlate with lower resilience. A 7Cs score greater or equal to four categorizes the subject as having low resilience (LR). Resilience was analyzed as a total score, high (7Cs score < 4) vs. low (7Cs score ≥ 4), and by its defining components (competence, confidence, connection, character, contribution, coping, and control).

The Contour Drawing Rating Scale [21] is a two-question form that asks participants to select which of nine female or nine male sized body figures best represents their current self and their ideal self. The figures are illustrated by precisely graduated body sizes with Drawing 1 as the thinnest and Drawing 9 as the heaviest. The degree of dissatisfaction with body size was calculated by subtracting the subject's perceived ideal body size from their perceived current body size. BSD is the absolute value of the degree of dissatisfaction with body size. The further from zero, the higher the BSD. Standards used in the clinics where subjects completed Contour Drawing Rating Scales included: the nine body size figures correlated with the 3rd, 5th, 10th, 25th, 50th, 75th, 85th, 95th, and 97th BMI percentiles and BSD defined as greater or equal to two figures between perceived ideal and perceived current body size, whereas less than two was considered body size satisfaction. Drawings 7, 8, and 9 in the Contour Drawing Rating Scale were categorized as overweight/obese. Reliability of this tool on assessing body size achieved a correlation of $r = 0.78$, and was highly significant, $P < 0.0005$, and validity to current body weight or $r = 0.71$, $P < 0.0005$ [21].

Participants' electronic health records were reviewed and demographic information, including age, gender, race, ethnicity, grade in school, and insurance, abstracted. BMI and BMI percentile were also abstracted. BMI was calculated using the subject's measured height and weight. The CDC 2000 growth charts [22] served as reference values. For subjects between the ages of thirteen through nineteen years old, weight status categories were assigned based on BMI percentile according to CDC definitions [22].

For subjects between the ages of twenty to twenty-one years old, weight status categories were assigned based on BMI [23]:

- Underweight – below 18.5
- Normal weight – 18.5–24.9
- Overweight – 25.0–29.9
- Obese – 30.0 and above.

Statistical analysis

Sample size was calculated using a $P \leq 0.05$, power 80%, and standard deviation of 2.38, based on the 7Cs tool validation. The desired effect size was between 1.0 and 2.0 on the combined score of the 7Cs tool. Using an effect size of 1.5, each group (high vs. low resilience) needed a sample of forty subjects. Extra subjects were enrolled to address missing data.

Statistical significance was defined as a two-side P-value less than or equal to 0.05. Strength of correlation was defined as negligible when less than 0.2, weak when between 0.2–0.4, moderate when between 0.5–0.7, and strong when 0.8 and above. Descriptive statistics and appropriate significant testing were used to report demographic data. Spearman Correlation Coefficients were used to examine the strength of association between actual BMI and perceived current body size. BMI was examined dichotomously: overweight/obese vs. not overweight or obese. Fisher's exact test was used to examine body size (overweight/obese and perceived overweight/obese), LR (7Cs score ≥4), BSD (BSD ≥ 2), and individual components of the 7Cs with variables of interest. Age was studied as a continuous variable. A model of predictive variables for BSD was tested and an adjusted analysis performed using binary logistic regression. SPSS Statistics 24 was used for statistical analyses [24].

Results

Characteristics of the participants

Eighty-five adolescents, ages thirteen to twenty-one years old participated in this study. Subject characteristics are provided in Table 1. The mean age was 16.0 years old ± 1.9 years. Forty-eight percent of the subjects were overweight (n = 11) or obese (n = 30) and forty-two percent of the study population had perceived overweight/obesity. There was a strong correlation between BMI percentile and perceived current body size ($r = 0.82$; $P < 0.001$). Fifty-three percent of the study population had LR, 7Cs score ≥4.

Table 1
Participant demographics.

	All adolescents (n = 85)	
Age (mean ± SD)	16.0 ± 1.9	
	n	%
Gender		
Female	55	65
Male	30	35
Race		
African American	36	42
Hispanic	31	36
Caucasian	14	16
Other[a]	4	5
Insurance		
Private insurance	23	27
Medicaid	59	69
Uninsured	3	4
Actual body size		
Obese	30	35
Overweight	11	13
Normal	42	49
Underweight	2	2
Perceived current body size		
Obese	17	20
Overweight	19	22
Normal	48	56
Underweight	1	1
Perceived ideal body size		
Obese	7	8
Overweight	8	9
Normal	70	82
Underweight	0	0
Body image[b]		
Body size dissatisfaction	27	32
Body size satisfaction	58	68
Resilience[c]		
Low resilience	45	53
Low connection	22	26
Low character	34	40
Low control	35	41
Low competence	47	55
Low contribution	48	56
Low coping	48	56
Low confidence	55	65

[a] Other includes Multi-White-Asian, Asian-Indian, other, and unknown.
[b] Body image defined by the Contour Drawing Rating Scale [21] (body size dissatisfaction = a difference between perceived current body size and perceived ideal body size of two or more figures; body size satisfaction = a difference between perceived current body size and perceived ideal body size of less than two figures).
[c] Resilience defined by the 7Cs tool (low resilience = 7Cs score ≥ 4; low individual components of the 7Cs = 7Cs component score ≥ 1).

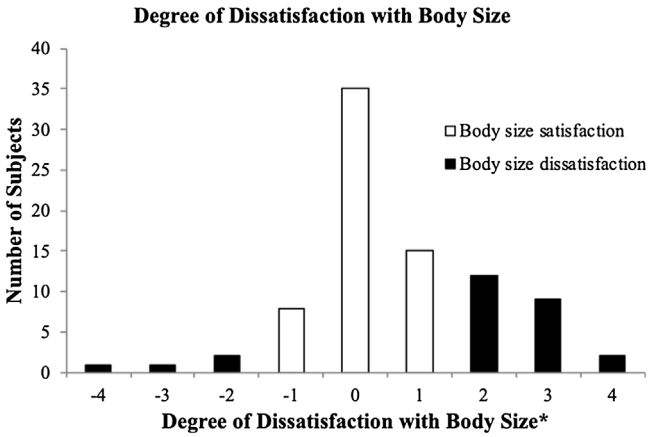

Fig. 1. Subjects' degree of dissatisfaction with body size based on Contour Drawing Rating Scale [21].
*Negative degree of dissatisfaction with body size (DDBS) signifies the subject desired a larger body size. Positive DDBS signifies the subject desired a smaller body size. Zero DDBS signifies no difference between the subject's current body size and ideal body size. The farther from zero in either direction signifies more dissatisfaction with their body size. Subjects were categorized as having body size dissatisfaction if their DDBS was greater or equal to two in either direction.

Table 2
Body size dissatisfaction by age, gender, race, body size, and resilience.

	Body size dissatisfaction (n = 27)		Body size satisfaction (n = 58)		P-Value[a]
Age (mean ± SD)	15.9 ± 1.9		16.0 ± 2.0		0.772
	n	%	N	%	
Gender					0.095
Female	21	78	34	59	
Male	6	22	24	41	
Race					**0.021**
African American	6	22	30	52	
Hispanic	15	56	16	29	
Caucasian and others[b]	6	22	12	21	
Actual body size					**<0.001**
Overweight and obese	21	78	20	34	
Not overweight or obese	6	22	38	66	
Perceived body size					**0.001**
Overweight and obese	19	70	17	29	
Not overweight or obese	8	30	41	71	
Resilience[c]					**<0.001**
Low resilience	22	81	23	40	
High resilience	5	19	35	60	

Bold values are P<0.05.
[a] Student t-test, chi-square, and Fisher's exact test as appropriate.
[b] Others includes Multi-White-Asian, Asian-Indian, other, and unknown.
[c] Resilience defined by the 7Cs tool (low resilience = 7Cs score ≥ 4).

Participants had a mean 7Cs score of 4.0, standard deviation of 3.0, and range of 0–14. Thirty-two percent of the study population had BSD, and eighty-five percent of the subjects with BSD wanted to be thinner (Fig. 1).

Overweight/obese adolescents had higher 7Cs scores (indicating lower resilience) than non-overweight/obese participants, 4.4 ± 2.6 and 3.6 ± 2.7, respectively, but this difference was not statistically different (P = 0.145). Perception of overweight/obesity was associated with higher 7Cs scores versus perception of not being overweight/obese, 4.5 ± 2.4 and 3.5 ± 2.8, respectively (P = 0.037), but not when resilience was analyzed by LR (7Cs score ≥ 4), (P = 0.123).

A univariate analysis between demographic variables and BSD is presented in Table 2. Overweight/obese and perceived overweight/obese were associated with BSD (OR 6.7; 95% CI 2.3–19.1; P < 0.001, and OR 5.7; 95% CI 2.1–15.6; P < 0.001, respectively). LR and Hispanic ethnicity were also associated with BSD (OR 6.7; 95% CI 2.2–20.2; P < 0.001, and OR 6.2; 95% CI 1.3–8.5; P < 0.013, respectively).

Analysis of subcomponents of resilience

Subcomponents of resilience were tested to determine association with overweight/obesity, perception of overweight/obesity, and BSD. Subjects with low coping were two times more likely to have actual overweight/obesity (OR 2.8; 95% CI = 1.1–6.7; P = 0.029), and subjects with low contribution were three times more likely to have perceived overweight/obesity (OR 3.2; 95% CI = 1.3–8.0; P = 0.015). No other specific sub-components of resilience were predictive of overweight/obesity or perception of overweight/obesity. In the unadjusted analysis, subjects with low resilience in competence, confidence, connection, coping, and control were more likely to have BSD (Table 3).

Table 3
Body size dissatisfaction and individual components of low resilience.[a]

	OR	95% CI	P-Value
Competence	3.3	(1.2–8.9)	**0.021**
Confidence	4.7	(1.4–15.2)	**0.008**
Character	0.8	(0.3–2.2)	0.791
Connection	3.2	(1.3–8.3)	**0.018**
Contribution	1.9	(0.7–4.8)	0.243
Coping	4.0	(1.4–11.4)	**0.009**
Control	3.8	(1.4–9.9)	**0.009**

Bold values are P<0.05.
[a] Each component of low resilience defined by score ≥ 1.

Table 4
Model for body size dissatisfaction (BSD).[a]

	AOR	95% CI	P-Value
Body size (perceived overweight/obese)[b]	5.3	(1.7–16.5)	**0.004**
Resilience (low)[c]	6.4	(1.9–22.4)	**0.003**

Bold values are P<0.05.
[a] Adjustment variables included age (continuous), gender (female vs. male), and ethnicity (Hispanic vs non-Hispanic).
[b] Perceived weight defined as perceived overweight/obese vs. perceived not overweight/obese.
[c] Resilience defined as low resilience (7Cs score ≥ 4) vs. high resilience (7Cs score < 4).

Model for body size dissatisfaction (BSD)

A model of predictive variables, body size (perceived overweight/obesity vs. perceived non-overweight/obese) and resilience (LR defined by 7Cs score ≥4 vs. high resilience), was tested and adjusted for age (continuous), gender (female vs. male), and Hispanic ethnicity, to determine their independent effects on BSD. In the adjusted analysis (Table 4), perceived overweight/obesity was approximately five times more likely to be associated with BSD (AOR 5.3; 95% CI = 1.6–14.5; P = 0.004) and LR was approximately six times more likely to be associated with BSD (AOR 6.4; 95% CI = 1.9–22.4; P = 0.003).

Discussion

As the obesity epidemic has been compounded by the stress of weight stigmatization, our study aimed to explore the relationship between overweight/obesity, resilience, and BSD in adolescents. While our study did not find a relationship between overweight/obesity or perceived overweight/obesity and resilience, we did find perceived overweight/obesity and LR to be independent predictors of BSD. LR had the strongest independent association with BSD. Additionally, we found adolescents with low resilience in the following sub-components, competence, confidence, connection, coping, and control, were more likely to have BSD. These findings provide an opportunity for impact given that resilience may be modifiable. By creating resilience-based training with a specific focus on helping adolescents develop behaviors, thoughts, and actions geared towards building competence, confidence, connection, coping, and control, adolescents may be able to improve both their resilience and body size satisfaction.

While LR had the strongest independent association with BSD in our study, perceived overweight/obesity was also found to be independently associated with BSD. This is consistent with previous research that overweight/obese adolescents are more likely than their counterparts to report BSD [12]. The strongest subcomponent of LR associated with BSD was low confidence. Low confidence may cause overweight/obese adolescents to doubt their ability to be successful in a society that promotes and normalizes a thin body image. Improving confidence, by helping adolescent achieve and recognize their own successes, may be important for improving BSD.

BSD may affect both adolescents who think they are fat and want to be slim as well as those who think they are thin and want to be big and muscular [25]. While the majority of adolescents in our study that had BSD wanted to be thinner, there were four participants with BSD that wanted to be larger and all had LR. Healthcare providers should recognize that adolescents with BSD may not always want to be thinner. For example, late-maturing boys may experience BSD, wanting to look larger and more muscular like their more mature classmates [26].

In our study, four out of five non-overweight/obese subjects who perceived themselves as overweight/obese had LR. Normal weight adolescents with LR and who perceive themselves as "fat," likely suffer from weight stigma and may benefit from resilience training. This sub-population may also reflect underlying body image distortion as a component of eating disorders. Future research is needed specific to this subgroup, potentially as a preventative or therapeutic approach to BSD, and possibly in the treatment regimen of eating disorders.

Our study had several limitations. The subjects in this study had higher 7Cs scores (lower resilience) compared to the population studied by Barger et al. that was used to validate the 7Cs tool [18]. The mean score was higher (4.0 vs. 3.0), the standard deviation was wider (3.0 vs. 2.4), and the total score range was wider (0–14 vs. 0–10). The mean age of the subjects in this study was 16.0, 1.1 years younger than the population used to validate the 7Cs tool. Younger subjects in our study population had higher 7Cs scores (lower resilience). This is in contrast to the population studied by Barger et al. This tool lacks validation by another investigator in another population.

Other limitations included use of a cross-sectional observational design and convenience sample from a large, multi-site, academic medical center, making it difficult to know the temporal sequence of variables in the analysis, as well as generalize results to other populations. While most subjects were recruited during a well child visit, the sample may be skewed since it is drawn from a clinical population and not another setting such as schools. The majority of our subjects were African American or Hispanic, from an urban, underserved area, and were insured through Medicaid. Additionally, the study population was limited to patients who come from families proficient in English. Multiple participants were denied study participation secondary to their guardian's or their own lack of English proficiency. It is important for the 7Cs tool to be validated in other languages in order to permit more diverse subject participation. The percentage of overweight/obese subjects in this study was larger than the percentage in the general population. The study population had more females than males. An additional limitation was that no data was collected on the subjects who declined participation, however we believe that approximately 20% declined participation, many being obese males. Future studies should address this sampling bias and include an analysis of the demographics and BMI of patients who declined to participate. Patients with obesity and lower resilience may be more likely to decline study participation, however their inclusion would have magnified the effect of our findings. Finally, the wide confidence intervals are indicative of the relatively small sample size.

This study was designed to compare overweight/obese adolescents to all other adolescents, therefore, underweight was grouped with normal weight. Although unlikely as the sample was small, the two underweight subjects may have weakened or hidden a relationship between overweight/obesity and normal weight. To check, the total dataset was analyzed as normal weight vs. weight outside the normal range and similar results were found. Similarly, when overweight/obesity was used instead of perceived overweight/obesity in the model, similar independent predictors of BSD

were determined (LR and overweight/obesity). Future larger studies can elucidate sub-categories for underweight, normal weight, overweight, and obese subgroups analyzed separately.

Conclusions

While there was no relationship between overweight/obesity and resilience, adolescents with LR were more likely to have BSD. Reducing weight stigma by creating a supportive healthcare and community environment may reduce BSD. Future studies may reveal how positive resilience training focusing on competence, confidence, connection, coping, and control may also improve body size satisfaction.

Ethical statement

Approval to conduct the study was sought from the Cooper University Hospital Institutional Review Board. In addition, written consent of the participants and their parents were sought prior to data collection.

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Conflict of interest

None declared.

CRediT authorship contribution statement

Stephanie Borinsky: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft. **John P. Gaughan:** Methodology, Formal analysis. **Lori Feldman-Winter:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Supervision.

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