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Association of body image dissatisfaction, behavioral responses for healthy eating, and cardiovascular health in African-American women with overweight or obesity: A preliminary study



Chandrika Manjunath^a, Sarah M. Jenkins^b, Sean Phelan^b, Carmen Radecki Breitkopf^b, Sharonne N. Hayes^a, Lisa A. Cooper^c, Christi A. Patten^d, LaPrincess C. Brewer^{a,e,*}

^a Department of Cardiovascular Medicine, Mayo Clinic, Rochester, MN, United States

^b Department of Quantitative Health Sciences, Mayo Clinic, Rochester, MN, United States

^c Division of General Internal Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, United States

^d Department of Psychiatry and Psychology, Mayo Clinic, Rochester, MN, United States

^e Center for Health Equity and Community Engagement Research, Mayo Clinic, Rochester, MN, United States

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ABSTRACT

Background: African-American (AA) women have the lowest prevalence of ideal categorizations of diet and body mass index (BMI), as defined by the American Heart Association (AHA) Life's Simple 7 (LS7) cardiovascular health (CVH) components compared to other racial/ethnic groups, regardless of sex/gender. There is limited research exploring the interplay of unique psychosocial influences on CVH such as body image dissatisfaction (BID) and behavioral responses for healthy eating among AA women with overweight or obesity.

Objective: This study aimed to assess the association of BID with behavioral responses for healthy eating and LS7 components.

Methods: A cross-sectional analysis of baseline data was conducted among 32 AA women with overweight or obesity from a larger, community-based participatory research study. Self-reported measures were used to assess BID and behavioral responses to healthy eating (diet self-regulation to reduce fat or caloric intake and motivation for healthy eating [intrinsic motivation and integrated regulation]) using previously validated instruments. The LS7 components (e.g., BMI, diet, etc.) and composite score were evaluated using the AHA LS7 metrics rubric.

Results: Women with no or lower BID had greater diet self-regulation to reduce fat or caloric intake (mean, 3.5 vs 3.0; $P=.05$), intrinsic motivation for healthy eating (mean, 5.3 vs 4.2; $P=.01$), and integrated regulation for healthy eating (mean, 5.3 vs 3.7; $P=.002$) than those with higher BID. These significant differences remained after adjustment for BMI. Women with higher BID had a higher proportion of BMI within the obesity range compared with those with no or lower BID (94.4% vs 57.1%, $P=.03$). BID was not significantly associated with other LS7 components or composite score.

Conclusion: BID and other psychosocial influences for healthy eating are potential targets for culturally tailored lifestyle interventions among AA women.

1. Introduction

African-American (AA) women are disproportionately burdened by cardiovascular disease (CVD), compared to the US population [1]. They also have the lowest prevalence of ideal categorizations of diet and body mass index (BMI) as defined by the American Heart Association (AHA) "Life's Simple 7" (LS7) [1] compared to other racial/ethnic groups re-

gardless of sex/gender, which pointedly increases their chance of poor cardiovascular health (CVH) outcomes and risk factors (e.g., hypertension, diabetes mellitus, dyslipidemia) [2–4].

Greater prevalence of unhealthy diet among AAs has been attributed to systemic, cultural, and historical factors [5–10], as well as stronger AA ethnocultural identity [8]. Evidence suggests that AA women tend to prefer larger body sizes and have higher levels of body size misperception [11] and body satisfaction than white women [12,13]. This

Abbreviations: AA, African-American; AHA, American Heart Association; BID, body image dissatisfaction; BMI, body mass index; CVD, cardiovascular disease; CVH, cardiovascular health; FAITH!, Fostering African-American Improvement in Total Health; LS7, Life's simple 7; SCT, Social Cognitive Theory; SDT, Self-Determination Theory.

* Corresponding author at: Department of Cardiovascular Medicine, Mayo Clinic, 200 First St. SW, Rochester, MN 55905, United States.

E-mail address: brewer.laprinCESS@mayo.edu (L.C. Brewer).

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has been attributed to culturally accepted social and body image norms and resistance to Western normative body ideals [14–16]. Nonetheless, some AA women do express body image dissatisfaction (BID) [14,17]. BID may derive from weight-based discrimination [18] and internalized stigma. BID is associated with psychological stress, depression, anxiety [19–21], and hormonal and inflammatory processes linked to CVD [22,23]. Perceiving oneself as overweight is associated with poor clinical indicators of CVH and unhealthy eating behaviors independent of BMI [24,25]. BID has predicted eating disturbances (e.g., binge eating), possibly acting as a maladaptive coping response to BID-related stress [26]. Still, behavioral responses or mechanisms linking BID to eating are poorly understood, especially among AA women.

Few studies have probed distinct sociocultural factors that may explain disproportionately less healthful diet among AA women. One factor is the Superwoman Schema, a sociocultural and historical legacy, wherein some AA women hold numerous roles to support their families and communities [27]. Self-care neglect and emotional eating to manage difficulties may arise, increasing risk of overweight, obesity, and cardiometabolic diseases [27–29]. However, AA women have indicated that the autonomy inherent to the schema can promote feelings of resiliency and self-motivation [27]. Greater understanding of associations between specific sociocultural and psychosocial factors (e.g., BID) and ideal CVH could help design more effective health behavior change interventions among AA women [8]. Further, theory-supported interventions have demonstrated increased adoption and maintenance of health behavior change among AA women [30]. Thus, we selected theory-based behavioral responses to investigate with relevance to resiliency and self-motivation [27,31], specifically diet self-regulation and motivation for healthy eating.

Diet self-regulation originated from Social Cognitive Theory (SCT), which posits that behavior change is influenced by environmental, behavioral, and personal factors [32,33]. Self-regulation involves using management skills—goal setting, planning, and monitoring—to achieve and maintain behaviors. Motivation for healthy eating arose from Self-Determination Theory (SDT), which proposes 6 behavior regulation styles that lie on a continuum of their extent of self-determination [34,35]. Generally, greater self-motivation and perception of completely autonomous self-regulation is positively associated with attaining and sustaining healthy diet [32,34,36,37]. The expressed resiliency and self-motivation following from the Superwoman Schema could potentially be leveraged in AA women to yield healthful eating behaviors [27,32,34,36,37].

The current study objectives were to: 1) evaluate the association of behavioral responses for healthy eating with BID and 2) assess whether AA women with overweight and obesity reporting higher BID were less likely to have ideal LS7 components than those with no or lower BID. We hypothesized that higher BID would be negatively associated with behavioral responses for healthy eating in AA women with overweight and obesity.

2. Methods

The study protocol was approved by the Mayo Clinic Institutional Review Board.

All participants provided written informed consent.

2.1. Study design and participants

Cross-sectional analyses were performed of baseline data from the Fostering African American Improvement in Total Health (FAITH!) App pilot study [38], a single-arm, nonrandomized, community-based participatory research study that tested a novel, mobile health lifestyle intervention to promote CVH among AAs [39]. Our academic institution collaborated with community partners from 5 predominantly AA churches in small and large Midwestern metropolitan cities [38]. Inclusion criteria

for the parent study are described elsewhere (35) and for the current study were female sex and BMI ≥ 25 kg/m².

2.2. Measures

Study participants completed baseline and follow-up electronic (online) surveys in July 2016 and April 2017, respectively, generated using Qualtrics survey software (Qualtrics, Provo, UT) to assess baseline sociodemographic characteristics and measures.

2.2.1. Body image dissatisfaction

The 9-item Pulvers scale [40] assessed participants' perceived current and desired body images and was used to calculate a BID score. Nine culturally adapted figures of AA women are displayed, each approximating a distinct BMI from underweight (BMI, 16 kg/m²) to morbid obesity (BMI, 40 kg/m²), and assigned a position-dependent point value. Figures were presented to participants in random order to curtail potential response bias [41]. A BID score was calculated as the difference between perceived current body image and desired body image

(BID=Body Image(Current) - Body Image(Desired); range, -8 to 8). BID scores <0 indicate a desire to be heavier, >0 a desire to be thinner, and 0 indicates no dissatisfaction [42].

2.2.2. Behavioral responses for healthy eating

Three behavioral responses were assessed using previously validated instruments.

2.3. Diet self-regulation

Diet self-regulation to reduce fat or caloric intake was assessed using the 6-item Health Beliefs Survey [32]. Each item is rated on a scale from 1 (never) to 5 (always). The total score is calculated as the average of 6 items; higher scores indicate better self-regulation. Diet self-regulation showed acceptable internal consistency with Cronbach's α of 0.79.

2.4. Motivation for healthy eating

Two subdomains of motivation for healthy eating, *intrinsic motivation* and *integrated regulation*, were assessed by the Regulation of Eating Behaviors Scale [26]. Each domain includes 4 items, rated using a 7-point scale (1=not at all true to 7=very true for me). The total score is the average of the 4 items; higher scores indicate greater motivation/regulation. The measures showed acceptable internal consistency with Cronbach's α of 0.72 (intrinsic motivation) and 0.89 (integrated regulation).

2.4.1. Life's Simple 7 components/metrics

The AHA LS7 metrics rubric was used to calculate a composite score as a measure of overall CVH. The calculation considered each LS7 component (CVH behaviors: BMI, physical activity, diet, smoking; CVH factors: blood pressure, glucose, total cholesterol), and assigned points for each metric (2 for ideal, 1 for intermediate, and 0 for poor). The composite score was the sum of assigned points [43], with possible scores ranging from 0 to 14 (higher score indicating better CVH). A trained research nursing team collected anthropometric measurements to calculate BMI (weight, height), blood pressure, and laboratory studies (total cholesterol, glucose both by fingerstick). Participants reported health behaviors (physical activity, diet, and smoking) in baseline surveys [44,45].

2.5. Statistical analysis

Data were summarized as frequency and percentage or as mean with standard deviation (SD), as appropriate. The observed BID score range (score 0 to 4) was dichotomized as no or lower BID (BID score 0 or 1) and higher BID (BID score 2 to 4) to prevent any category from being overly sparse, given our sample size. Key measures were compared between groups with Fisher exact tests for categorical variables, Wilcoxon

Table 1
Baseline participant characteristics (N=32).

Characteristic	Value ^a
Age, mean (SD), y	49.4 (12.9)
BMI, No. (%)	
25-29.9 kg/m ² (overweight)	7 (21.9)
≥30 kg/m ² (obesity)	25 (78.1)
Weight, mean (SD), kg	92.5 (19.0)
Marital status, No. (%)	
Single	7 (21.9)
Divorced	4 (12.5)
In a committed relationship or married	19 (59.4)
Widowed	2 (6.3)
Highest level of education, No. (%)	
High school graduate, GED equivalent, or some college	10 (31.3)
Technical degree or associate degree	10 (31.3)
College graduate or advanced degree	12 (37.5)
Employed (at least part time), No. (%)	23 (71.9)
Annual household income, No. (%)	
≤\$49,999	18 (62.1)
≥\$50,000	11 (37.9)
Self-reported diagnoses, No. (%)	
Depression	8 (25.0%)
Anxiety	7 (21.9%)
Concordance between measured BMI category and current perceived body image category, No. (%)	
Discordant	6 (18.8)
Concordant	26 (81.3)

Abbreviations: BMI, body mass index; GED, general equivalency diploma.

^a Frequencies not adding to total (N=32) indicate missing data or participant selection of “choose not to answer”.

rank-sum tests for ordinal variables, and 2-sample t-tests for continuous variables. Associations between BID (X) with the behavioral responses scale scores (Y) were adjusted for BMI category with linear regression, and adjusted mean differences were reported. *P* values ≤.05 were considered statistically significant.

Analyses were performed with SAS version 9.4 (SAS Institute Inc., Cary, NC).

3. Data availability statement

The data supporting the study findings are available from the corresponding author (L.C.B.) upon reasonable request.

4. Results

4.1. Demographic characteristics and BID

Of the 50 men and women enrolled in the FAITH! study [39], 32 met the criteria of female sex with overweight (BMI, 25-29.9 kg/m²; n=7 [21.9%]) or obesity (BMI ≥30 kg/m²; n=25 [78.1%]) and were included in this analysis (Table 1). Mean (SD) age was 49.4 (12.9) years. Over half of women reported being in a committed relationship or employed; a quarter reported a diagnosis of depression. Demographic characteristics did not significantly differ by BMI or BID. BID scores ranged from 0 to 4. Fourteen women (43.8%) had no or lower dissatisfaction (BID, 0 or 1) and 18 (56.3%) had higher dissatisfaction (BID, 2 to 4). No women had BID below 0 (i.e., none desired a heavier BMI). Most women with overweight (4/7 [57.1%]) desired a normal range BMI and 42.9% [3/7] aimed to remain the same. Most women with obesity desired a lower BMI in either the overweight range (18/25 [72.0%]) or normal weight range (5/25 [20.0%]), and 8.0% [2/25] desired to maintain their BMI.

4.2. Behavioral responses for healthy eating and BID

Women with no or lower BID had greater *diet self-regulation* to reduce fat or caloric intake (mean, 3.5 vs 3.0; *P*=.05), significantly higher *intrinsic motivation for healthy eating* (mean, 5.3 vs 4.2; *P*=.01), and greater *in-*

tegrated regulation for healthy eating (mean, 5.3 vs 3.7; *P*=.002) than those with higher BID (Table 2). These significant differences remained when adjusted for BMI category. For no or lower BID, compared to those with higher BID, the adjusted mean difference was 0.5 for *diet self-regulation* to reduce fat or caloric intake (*P*=.04), 1.4 for *intrinsic motivation for healthy eating* (*P*=.0009), and 1.7 for *integrated regulation for healthy eating* (*P*=.001).

4.3. LS7 components and BID

LS7 components stratified by BID level are presented in Table 2. Mean LS7 composite scores were lower [non-significantly] among those with higher BID (vs lower BID). Of all LS7 components, only BMI was statistically significantly different between BID strata. Based on measured BMI, a significantly higher percentage of women with higher BID had obesity than those with no or lower BID (94.4% vs 57.1%; *P*=.03).

5. Discussion

In this preliminary study of AA women with overweight or obesity, higher BID was associated with lower levels of diet self-regulation and motivation for healthy eating, and higher BMI. While causal inferences cannot be made due to the cross-sectional study design, our findings suggest that interventions to improve body image and behavioral responses for healthy eating may promote healthier diet in AA women.

Studies have proposed higher BID may encourage healthy eating behaviors [46,47]; our study and others suggest the contrary. One review found higher BID correlated with suboptimal nutritional intake among AA women [48]. In a study among church-goers (N=712, 66% female, 18% AA, 79% with overweight or obesity), participants reporting greater versus lower self-regulatory behavior use had healthier diets, including lower fat intake [36]. Like other groups [34,49], among our participants higher BID was associated with less self-motivation for healthy eating, specifically, intrinsic motivation and integrated regulation.

Table 2
Behavioral responses and LS7 components/metrics, stratified by body image dissatisfaction category.

Behavioral Response Measure or LS7 Component/Metric	Total (N=32) ^a	No or Lower BID (n=14) ^a	Higher BID (n=18) ^a	P Value
Behavioral Response Measures				
Diet self-regulation to reduce fat or caloric intake, mean (SD) ^b	3.2 (0.72)	3.5 (0.78)	3.0 (0.60)	.05
Motivation for healthy eating, mean (SD) ^c				
Intrinsic motivation	4.7 (1.29)	5.3 (1.20)	4.2 (1.16)	.01
Integrated regulation	4.4 (1.54)	5.3 (1.48)	3.7 (1.21)	.002
LS7 Cardiovascular Health				
LS7 composite score (overall CVH), mean (SD)	8.21 (1.99)	8.83 (2.17)	7.76 (1.79)	.16
LS7 Cardiovascular Health Behaviors				
BMI, No. (%)				.03
≥30 kg/m ² (obesity)	25 (78.1)	8 (57.1)	17 (94.4)	
25-29.9 kg/m ² (overweight)	7 (21.9)	6 (42.9)	1 (5.6)	
Physical activity, No. (%)				.15
Poor	11 (35.5)	2 (15.4)	9 (50.0)	
Intermediate	14 (45.2)	8 (61.5)	6 (33.3)	
Ideal	6 (19.4)	3 (23.1)	3 (16.7)	
Diet (fruit and vegetable intake), No. (%)				.41
Poor	7 (21.9)	4 (28.6)	3 (16.7)	
Intermediate	16 (50.0)	5 (35.7)	11 (61.1)	
Ideal	9 (28.1)	5 (35.7)	4 (22.2)	
Smoking, No. (%)				.44
Poor	1 (3.1)	1 (7.1)	0 (0)	
Ideal	31 (96.9)	13 (92.9)	18 (100)	
LS7 Cardiovascular Health Factors				
Blood pressure				.24
Poor	14 (43.8)	4 (28.6)	10 (55.6)	
Intermediate	12 (37.5)	6 (42.9)	6 (33.3)	
Ideal	6 (18.8)	4 (28.6)	2 (11.1)	
Glucose				.35
Poor	2 (6.7)	2 (15.4)	0 (0)	
Intermediate	5 (16.7)	2 (15.4)	3 (17.6)	
Ideal	23 (76.7)	9 (69.2)	14 (82.4)	
Total cholesterol				.59
Poor	3 (9.4)	1 (7.1)	2 (11.1)	
Intermediate	5 (15.6)	1 (7.1)	4 (22.2)	
Ideal	24 (75.0)	12 (85.7)	12 (66.7)	

Abbreviations: BID, body image dissatisfaction; BMI, body mass index; LS7, Life's Simple 7.

^a Frequencies not adding to column total indicate missing data.

^b Average of 6 items rated on a scale from 1 ("never") to 5 ("always").

^c Subdomains were each scored as average of 4 items, rated on a 7-point scale (1="not at all true" to 7="very true for me").

5.1. Implications

We speculate that BID may be compounded with internalization of weight stigma, which can increase emotional eating, decrease diet self-regulation and motivation, and inflate physiologic dysregulation (e.g., hyperactive hypothalamic-pituitary-adrenal axis and sympathoadrenal-medullary axis). Over time this can lead to impaired adaptive responses of cardiometabolic, neuroendocrine, and immune systems, placing AA women at greater risk of obesity and CVD (Fig. 1) [6,22–24,51].

In alignment with SCT and SDT behavioral change frameworks, we suggest efforts to first alleviate psychosocial stressors such as BID in AA women to promote healthy eating through integrating diet self-regulation and motivation for healthy eating. As proposed by SCT, better self-regulation relies on the ability to effectively plan and monitor progress towards set goals [36]. Interventions could integrate practice of these skills to improve diet self-regulation among AA women. In one SDT-based weight management intervention, improved body image was shown to enhance eating self-regulation among women with overweight or obesity [52]. The intervention included a body image module which outlined strategies such as recognizing social and personal roots of body image development, keeping a diary to self-monitor critical body image experiences, and coping with body image stereotypes and prejudice [52]. Though the study did not include AA women, it demonstrated the positive effects of improving psychosocial stressors like BID while supporting autonomous decision-making for successful weight control. Further, the proactive, therapeutic strategies implemented in the study

could potentially benefit AA women and are worthy of exploration in future investigations. SDT-based interventions such as motivational interviewing may encourage a sense of autonomy by settling ambivalence to find intrinsic motivation for behavior change [53]. Evidence supports motivational interviewing as effective among AAs in creating positive dietary change and is thus also a plausible interventional strategy [53].

The Superwoman Schema [27] exhibits influence on the well-being of AA women, with expressed benefits including cultivating positive self-image, self-motivation, and intrinsic determination [23,24,50]. Accordingly, we propose its consideration to improve the similarly autonomously-motivated behavioral responses examined in this study and BID among AA women with overweight or obesity. Interventions should be culturally tailored to maximize efficacy [54,55]. Some cultural considerations for our study population consistent with the Superwoman Schema could include 'body image ideals' and 'centrality of women' [56]. For instance, related to the centrality of women, interventions enacting culturally-tailored civic engagement approaches to behavior change have been shown to influence positive health behavior changes among AA women [57]. Civic-engagement involves collective group work to improve community-level issues and can be leveraged for healthy lifestyle promotion. Positive effects have included improved self-regulation (goal-setting, monitoring) and healthier dietary behaviors (e.g., decreased caloric intake). Further, the group itself provides social support, which also engenders positive effects on health behaviors [57].

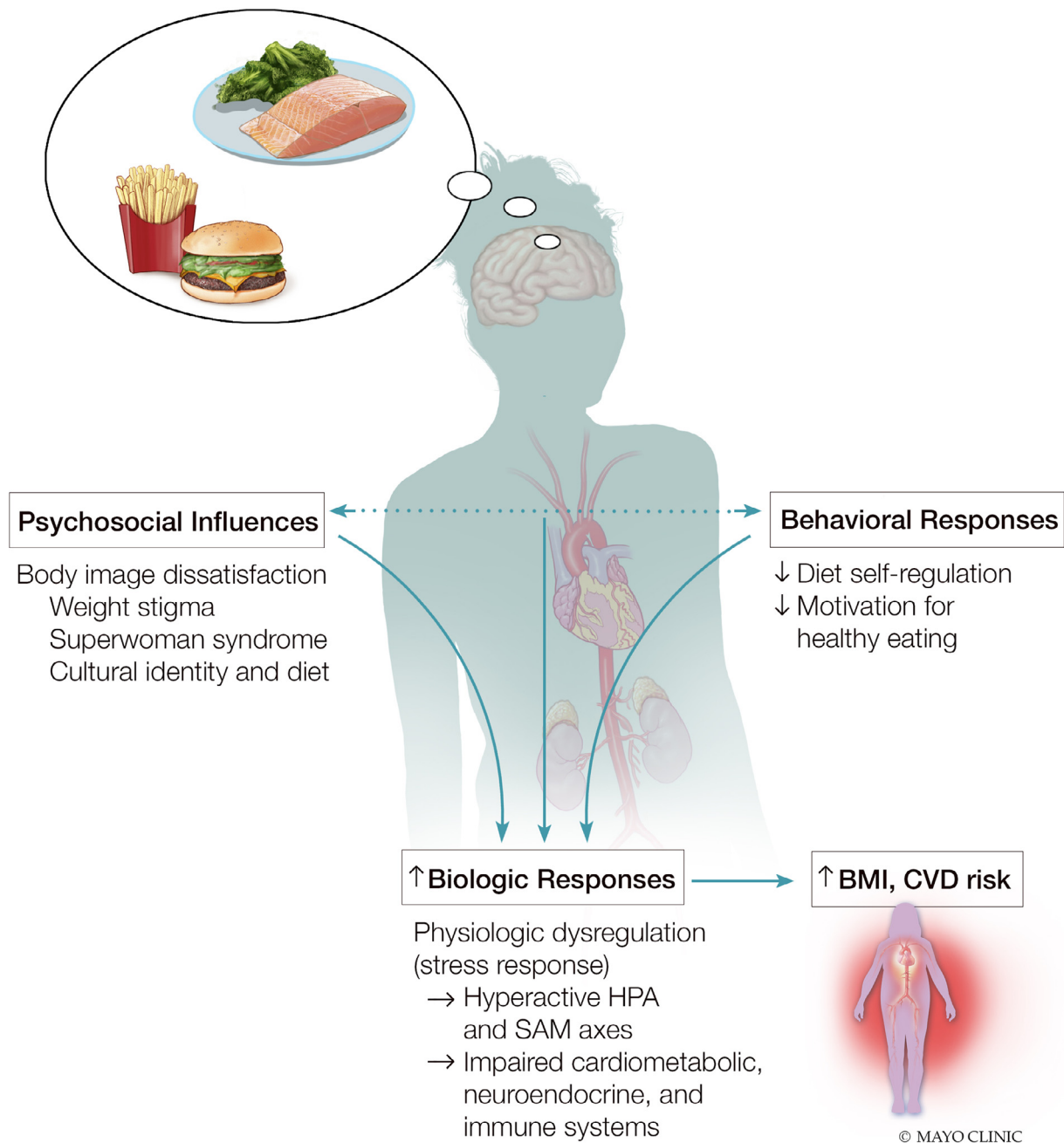


Fig. 1. Central Illustration. Proposed biobehavioral mechanism of interactions between psychosocial influences, behavioral responses for healthy eating, and consequent biologic responses, and their aggregate deleterious effects on BMI and CVD among African-American women with overweight or obesity. The psychosocial influence, BID, is suggested to be compounded by weight stigma, the Superwoman syndrome unique to African-American women, and African-American cultural identity and diet. Increased BID is shown to influence health behavior responses, in this case, decreased diet self-regulation and motivation for healthy eating. These behavioral responses may then exacerbate BID and its related factors due to a decreased sense of self-efficacy. Without intervention, this loop may continue and heighten physiologic dysregulation due to stress, with subsequent increases in BMI and CVD risk. Abbreviations: BID, body image dissatisfaction; BMI, body mass index; CVD, cardiovascular disease; HPA, hypothalamic-pituitary-adrenal; SAM, sympathoadrenal-medullary.

5.2. Strengths and limitations

This preliminary study has several strengths and limitations. To our knowledge, no previous studies investigated BID, behavioral responses, and LS7 components/metrics among AA women. Few have specifically examined self-regulation and self-motivation in AA women. With the centrality of food in AA culture, examination of these associations is imperative to improving healthy eating behaviors while maintaining cultural identity [8]. Further, including women within the AA faith community offered insights into this influential group

to potentially promote ideal CVH within the AA community more broadly.

Our small sample size and its relative homogeneity within the faith community limit generalizability to AA women in the broader AA community or other regions of the US. Analyses were underpowered to detect differences in LS7 indicators between groups and formal mediation of the behavioral responses with BID and the LS7. The cross-sectional study design limited assessment of temporal associations, dynamic environmental influences, or causality inferences about observed relationships between BID, assessed behavioral responses, and LS7. As a conve-

nience sample of AA women, participants may have already had greater motivation for healthy behavior change.

6. Conclusion

Our findings suggest that higher BID is significantly associated with low diet self-regulation and motivation for healthy eating among AA women with overweight or obesity. These factors are critical for initiating and maintaining healthy lifestyle behavior change. Of all LS7 components, only higher BMI in the obesity range was demonstrated among women with higher BID compared to those with no or lower BID. BID and other psychosocial influences may have public health implications as potential targets for culturally tailored lifestyle interventions among this demographic.

Author contributions

All authors have participated intellectually or practically to this work, including the conception (Brewer, Manjunath), design (Brewer, Manjunath, Patten), data analysis (Brewer, Jenkins, Manjunath), data interpretation (Brewer, Jenkins, Manjunath), and drafting of the manuscript (Brewer, Cooper, Hayes, Jenkins, Manjunath, Patten, Phelan, Radecki Breitkopf).

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Declaration of Competing Interest

All authors declare that no competing financial interests exist.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.ajpc.2021.100254](https://doi.org/10.1016/j.ajpc.2021.100254).

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