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## Weight Discrimination Experienced Prior to Enrolling in a Behavioral Obesity Intervention is Associated with Treatment Response among Black and White Adults in the Southeastern U.S.

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### Abstract

**Background:** The current study evaluated the associations between history of weight discrimination and race on pre-treatment depressive symptoms, treatment session attendance, and weight loss among Black and White adults enrolled in a 16-week obesity intervention.

**Methods:** Participants (N=271; mean BMI=35.7 kg/m<sup>2</sup>; 59% Black; 92% women) reported prior experiences of weight discrimination and completed the Center for Epidemiological Studies Depression (CES-D) Scale at baseline. Weekly attendance at group sessions was recorded, and weight was measured at baseline and post-treatment. All models adjusted for baseline BMI, age, and sex.

**Results:** Participants with a history of weight discrimination scored 2.4 points higher on the CES-D (B=2.432, *p*=.012) and lost 2% less weight relative to those without weight discrimination (B=0.023, *p*=.002). Race modified the association between weight discrimination and treatment session attendance, such that Black individuals attended fewer sessions if they had prior experience of weight discrimination, but prior weight discrimination was not significantly associated with treatment attendance among White individuals.

**Conclusions:** Weight discrimination is associated with pre-treatment depressive symptoms and may hinder weight loss regardless of race. Black individuals may attend fewer weight loss treatment sessions if they have prior experience of weight discrimination.

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## Keywords

Weight discrimination; weight loss; race; depression; obesity intervention

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## INTRODUCTION

Weight-related stigma remains an inadequately-addressed public health concern, and its effects on health outcomes are still being realized (1–3). Weight discrimination is the behavioral manifestation of societal weight stigma that is the unfair treatment of people on the basis of their weight (4,5). Approximately 19% of people with class I obesity (BMI = 30–35 kg/m<sup>2</sup>) experience some form of everyday discrimination related to their weight status, and that estimate increases to 42% among individuals with higher weight statuses (6). Unfortunately, weight-related stigma is increasingly prevalent, even among healthcare providers (7), despite decades of research demonstrating that weight bias reduces care-seeking for serious medical conditions (8,9), increases purposeful delays of healthcare appointments (10), and reduces perceptions of care quality during healthcare visits (11,12). Outside of healthcare, weight discrimination is associated with unhealthy weight-control practices (13), disordered eating behaviors (14,15), reduced self-efficacy making dietary changes (13), and negative attitudes towards fitness centers (16). Weight discrimination is also associated with increased risk for negative physical health outcomes (17), weight gain (18), depression (19), poorer psychological health (20), and mortality (21).

In spite of the evidence for the negative health outcomes of weight-related stigma, little research focuses on its role in weight loss among obesity treatment-seeking individuals (3). Some colloquial beliefs remain that weight-related stigma is a tool that may motivate people with overweight and obesity to lose weight (22–24). Only one study found individuals (84% women, 96% white) who endorsed more weight-based stigmatization and fear of fatness lost more weight over the course of an intervention (25). One study documented greater depressive symptoms and less weight loss among individuals (82% women, 89% white) who took part in a 14-week weight loss intervention and endorsed prior interpersonal experiences of weight discrimination (26). An observational study of primary care patients (48% women, 76% white) found lower likelihood of 10% weight loss among patients who perceived judgment by their primary care provider (27). This body of research on the relationship between weight discrimination and weight loss represents a significant sampling bias, given it was undertaken with racially homogenous white samples. Black adults endure disproportionate risk for both obesity and related subsequent health conditions (28,29). Significant racial disparities exist in obesity and its treatment (30,31). For instance, nearly 55% of Black women have obesity, compared to 38% of White women, and Black individuals consistently lose less weight in behavioral weight loss interventions (30).

Differences in perceptions of weight discrimination between racial and ethnic groups have not been widely studied. One longitudinal cohort study found perceived weight discrimination is most prevalent among White women compared to Black women and Black and White men (32). Another observational study found equivalent experiences of weight discrimination between racial groups, but White men and women were more

likely to internalize weight stigma compared to Black men and women (33). Literature on body image and body size preference by race also offers mixed results. Some evidence suggests Black individuals prefer larger body sizes (34), which could buffer against the effects of weight discrimination. Other researchers have found no clear body size preference among Black individuals (35). It is unclear whether racial disparities in perceived weight discrimination differ among treatment seeking adults, and how those experiences may impact treatment efficacy.

The Cyclic Obesity/Weight-based Stigma model (36) characterizes the processes by which weight discrimination may impact weight loss outcomes. Weight stigma and discrimination are chronic stressors that result in emotional, behavioral, and physiological outcomes making weight loss more difficult (36,37). In the present study, we consider the associations between weight discrimination and depressive symptoms (emotional outcome), weight loss treatment attendance (behavioral outcome), and weight change (physiological outcome). There is a consensus that weight discrimination negatively impacts mental health (38). Fewer studies have considered whether weight discrimination impacts treatment engagement and weight loss in obesity interventions and if these outcomes differ among individuals from racially diverse backgrounds.

The present study evaluated the impact of perceived weight discrimination on depressive symptoms, attendance in a behavioral weight loss intervention, and weight change in a sample of Black and White treatment-seeking adults with overweight or obesity. Both main effects and interactions of weight discrimination and race were considered. A priori hypotheses included: 1) experiences of weight discrimination would be associated with greater depressive symptoms, lower intervention attendance, and less weight loss, and 2) these associations would be greater among White participants relative to Black participants.

## **METHODS**

### **Participants**

Participants were adults 21 years old recruited for a weight loss study through advertisements in the local newspaper, television, flyers, and university-affiliated websites and e-newsletters. Participants were eligible for the program if their body mass index (BMI;  $\text{kg}/\text{m}^2$ ) was between 28 and 45 at screening. Exclusion criteria included weight loss of  $>4.5$  kg in the past 6 months, having taken a weight loss medication in the past 6 months, diagnosis of a medical condition for which weight loss or physical activity would not be advised, plans to relocate from the area within 18 months of the intervention, and inability or unwillingness to attend group sessions. Participants included in the present analysis attended at least one session of the weight loss program.

### **Procedure**

This study is a secondary data analysis of a 16-week behavioral weight loss intervention. The intervention protocol and main findings have been published elsewhere (39), which focused on a 2-arm randomized controlled trial (RCT) comparing 12-month weight loss maintenance among a sample previously achieving 5% weight loss. Prior to the weight loss

maintenance RCT, participants received a 16-week behavioral intervention designed to elicit initial weight loss required for randomization into the RCT. This 16-week intervention is the focus of the current project, and the present study includes all participants in the initial intervention who completed at least one treatment session. Participants contacted project staff via telephone to assess preliminary eligibility for the intervention. Eligible participants could attend an orientation session and complete informed consent, during which height and weight measurements confirmed BMI eligibility. Participants who provided informed consent then returned for a baseline visit and enrolled in the program.

The program included weekly group sessions of 15–20 participants led by an interdisciplinary team of dietitians, exercise specialists, and clinical psychologists. During the program, participants worked towards a minimum 5% weight loss goal. Intervention content was modeled after evidence-based lifestyle interventions (40,41). Following completion of the intervention, participants returned for a follow-up assessment. All study procedures were approved by the university's Institutional Review Board and registered on [clinicaltrials.gov](https://clinicaltrials.gov) (NCT#02487121).

## Measures

**Demographic Information.**—At baseline, participants provided information regarding their age, sex, race, education attainment, income, and marital status.

**Weight Discrimination.**—History of perceived weight discrimination was assessed using a modified version of the Experiences of Discrimination Index (42). At their baseline visit, participants were asked the following question: “Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your weight?” Participants could endorse discrimination across a variety of situations (e.g., at school, at home, getting medical care). Because only 34% of participants (n=93) endorsed any experience of weight discrimination, results were pooled into a single dichotomous variable (1=reported experiencing discrimination in at least one setting, 0= no experiences of discrimination) as has been done in previous studies (32,43,44).

**Anthropometric Measures.**—BMI was calculated at baseline and post-intervention using participant height and weight measurements. Height was measured using a wall-mounted stadiometer. Weight was measured to the nearest 0.1 kg using a calibrated digital scale. Percent weight change was calculated using the difference between participants' post-intervention weight and their baseline weight.

**Depressive Symptoms.**—Depressive symptoms were assessed at baseline using the Centers for Epidemiologic Studies Depression Scale (CES-D;(45), which assesses cognitive, affective, vegetative, and interpersonal symptoms of depression.

**Weight Loss Program Session Attendance.**—Attendance was recorded at each of the 16 group sessions. Total session attendance was summed for each participant yielding a count variable of sessions attended (Range=1–16, skewness=–0.26). Participants were excluded from the present analysis if they did not attend any sessions.

## Data analysis

All data were analyzed using SAS version 9.4. Descriptive analyses characterized the sample. To determine study covariates, t-tests, ANOVA, and linear regression, and quasi-Poisson models were utilized. Outcome measures included: 1) depressive symptoms, 2) session attendance, and 3) % weight change from baseline to 16 weeks. Quasi-Poisson models were used for the session attendance count variable to adjust for over-dispersion. Over-dispersion was examined after adjusting for covariates in the model. The Pearson chi-square value for the adjusted Poisson model divided by its degrees of freedom was  $>1$  indicating over-dispersion (46). A formal test based on the Pearson chi-square statistic had a p-value of 0 also indicating over-dispersion. Therefore a quasi-Poisson model was used to accommodate over-dispersion in the Poisson model.

Missing data was handled using listwise deletion. For the outcomes of depressive symptoms and session attendance this resulted in missing responses for  $<3\%$  of the sample. Due to study attrition, 165 participants had outcomes for % weight change. We first considered whether attrition related to any demographic or study variables. Those analyses yielded significant differences for age and sex. Therefore, we proceeded with analyses for the full sample for the first two outcomes, and the sample of 165 participants for the % weight change outcome with age and sex included as covariates. Last observation carried forward was not used for the % weight change variable because attrition from obesity interventions is associated with weight gain (47), and treatment effects could be overestimated.

Multivariable analyses proceeded in the following steps. First, a linear regression analysis was used for the depressive symptoms and % weight changes outcomes and a quasi-Poisson model was used for the session attendance outcome, with dichotomized weight discrimination (yes/no) as the independent variable along with study covariates. Second, linear and quasi-Poisson regressions were used to evaluate the potential interaction between race and weight discrimination on the outcome variables.

## RESULTS

### Sample Description

Out of 1,142 individuals who pre-screened for eligibility by telephone, 322 presented for an orientation session and provided informed consent, and 305 individuals enrolled in the weight loss program. Of those, 271 participants attended at least one group session; these participants constituted the sample for the present analysis. A total of 165 participants completed their follow-up assessment for which % weight change was the primary outcome.

A description of demographic and study variables for the full sample and stratified by participant race is presented in Table 1. Of the 271 participants (mean age=48.6), 92% were female, and 59% were Black or African American. Mean baseline BMI for participants was  $35.7 \text{ kg/m}^2$ , ranging from 28.1 to 46.7. Some participants gained weight between their screening visit and their baseline visit such that the maximum BMI at baseline exceeded the maximum BMI for inclusion criteria, although these participants were permitted to enroll in the program.

There were statistically significant differences between Black and White racial groups in baseline demographic variables. Black participants were younger compared to White participants (mean age=45.6 and 53.5 respectively,  $p<0.001$ ). A higher proportion of Black participants were women (96%) compared to White participants (88%,  $p=0.020$ ). Fewer Black participants were married compared to White participants (45% and 60% respectively,  $p=0.020$ ). A greater proportion of Black participants had incomes  $\leq$  \$40,000 compared to White participants (39% and 35% respectively,  $p=0.010$ ). Black participants also had higher baseline BMI compared to White participants (mean BMI=36.2 and 35.1 respectively,  $p=0.041$ ). History of weight discrimination was more prevalent among White individuals (41%) than Black individuals (29%,  $p=0.035$ ).

Demographic and study variables were also compared between participants that completed with 16-week weight loss intervention and participants who did not complete the intervention (Table 2). “Completers” were older than “non-completers” (Mean age = 50.4 and 45.9 respectively,  $p=0.004$ ), more likely to be female (95% and 88% respectively,  $p=0.026$ ), and attended more treatment sessions (Mean session attendance = 12.4 and 4.1 respectively,  $p<0.001$ ).

### Covariate analysis

Age was associated with depressive symptoms ( $B=-0.12$ ,  $p=0.001$ ). Age ( $B=0.07$ ,  $p=0.004$ ) and baseline BMI ( $B= -0.14$ ,  $p=0.042$ ) were significantly associated with session attendance. Age ( $B=-0.001$ ,  $p=0.032$ ) was also significantly associated with % weight change. All other variables assessed were not associated with depressive symptoms, session attendance, or % weight change, including marital status, education, and income; these variables were subsequently excluded from analyses. Sex was included as a covariate due to the small number of men in the sample. Age, sex, and baseline BMI were included as covariates in all study analyses.

### Associations of weight discrimination and race with depressive symptoms, session attendance, % weight change

Prior history of weight discrimination was associated with greater depressive symptoms at baseline, such that those who had experienced weight discrimination scored 2.4 points higher on the CES-D compared to those who had not experienced weight discrimination after adjusting for baseline BMI, race, and age ( $B=2.432$ , 95% CI [0.543, 4.320],  $p=0.012$ ). In this analysis, race was also associated with baseline depressive symptoms with Black individuals reporting fewer depressive symptoms compared to White individuals ( $B=-1.960$ , 95% CI [-3.858, -0.061],  $p=0.043$ ). Weight discrimination was not associated with treatment session attendance during the weight loss intervention ( $B=-0.088$ , 95% CI [-0.234, 0.059],  $p=0.240$ ), nor was race ( $B=-0.021$ , 95% CI [-0.166, 0.123],  $p=0.771$ ).

Having prior experience of weight discrimination was associated with % weight change during the course of the 16-week intervention. Participants who experienced weight discrimination lost approximately 2% less weight on average compared to those who did not report prior weight discrimination ( $B=0.023$ , 95% CI [0.009, 0.038],  $p=0.002$ ), with age, sex, race, and baseline BMI included in the model. Race was not associated with %



weight change in this analysis ( $B=0.013$ , 95% CI [0, 0.028],  $p=0.064$ ). Full model results are displayed in Table 3.

### Moderation analysis by race

The interaction between weight discrimination and race was not statistically significant for depressive symptoms (interaction  $B=-1.224$ ,  $p=0.518$ ), nor was the interaction of race and weight discrimination on % weight change during the intervention (interaction  $B=-0.004$ ,  $p=0.769$ ). Although race and weight discrimination were not independently associated with session attendance, there was an interaction between race and weight discrimination for the session attendance outcome ( $B=-0.303$ ,  $p=0.039$ ). Black individuals attended 0.80 times fewer treatment sessions if they had a history of weight discrimination, while there was no significant relationship between prior weight discrimination and session attendance among White individuals. The relationships between weight discrimination, race, and the outcomes of depressive symptoms, session attendance, and % weight change are shown in Figure 1.

## DISCUSSION

Among adults entering treatment for obesity, prior history of weight discrimination was associated with several outcomes. First, experiences of weight discrimination were associated with depressive symptoms at the onset of treatment. Second, Black and White individuals with prior experiences of weight discrimination lost less weight during the behavioral weight loss intervention. Finally, weight discrimination was associated with reduced attendance at intervention sessions among Black individuals, but this relationship was not observed for White individuals.

These results are consistent with theories that weight-related stigma is a chronic stressor that may undermine mental health, self-efficacy, and weight loss efforts (36). Previous experimental research on the paradoxical effects of weight discrimination may also help explain results of this study (24,48). Experiences of weight-related stigma may increase individuals' motivation to lose weight indirectly through mechanisms of negative affect and concerns about future discrimination; in turn, weight-stigmatizing experiences reduce perceived self-efficacy and self-control to change health behaviors (24). Moreover, exposure to weight-stigmatizing messages produces negative affect related to the anticipation of future stigmatizing experiences (24), which simultaneously undermines executive control, self-regulation, and psychological health necessary for long-term health behavior change (49).

However, these conceptual models of the consequences of weight discrimination are informed by lab-based findings, and they have not yet been applied to participants in both community and treatment settings. The present findings extend these models to individuals actively engaged in obesity treatment. Individuals entering treatment with a history of weight discrimination may want to change their weight as much as, or more than, their peers without histories of weight discrimination. However, fear of future discrimination may ultimately undermine their weight loss efforts and subsequently reinforce perceptions of reduced self-control or self-efficacy (24,48).

Weight discrimination significantly undermined weight loss efforts of both Black and White adults in behavioral treatment for obesity. In this treatment seeking sample, White individuals reported greater prevalence of prior weight discrimination compared with Black individuals consistent with prior research in the CARDIA cohort (32). White individuals reported more depressive symptoms than Black individuals at treatment onset, but not necessarily because of weight discrimination. Associations of weight discrimination with depressive symptoms at treatment onset and weight loss outcomes do not necessarily differ by race in a group of Black and White adults seeking treatment for obesity.

Black individuals do not drop out of treatment more than White individuals. However, Black individuals may attend fewer treatment sessions if they have a history of weight discrimination. This finding does not seemingly support a race buffering hypothesis for weight discrimination, but may indicate other factors affecting treatment engagement among Black adults with a history of weight discrimination. Additional research is needed to understand and overcome the social and structural determinants of racial disparities in weight loss treatment engagement such as socioeconomic barriers (30), as well as structural racism and its intersection with weight-related stigma.

Study limitations include the use of a predominantly female sample and missing follow-up data for the % weight change outcome. Participant attrition was a significant limitation of this study, especially since individuals who discontinue participation often lose less weight. However, study dropout (“non-completers”) was unrelated to either weight discrimination or race; thus, retention was a significant concern but seemed unrelated to the primary study variables. It is also important to note that weight discrimination was evaluated as a dichotomous variable, which prohibited analyses comparing treatment outcomes based on discrimination frequency, severity, or setting. These other dimensions of weight discrimination should be evaluated in future research. Finally, this sample only included White and Black adults. Future research should evaluate more diverse samples including Hispanic populations, who are also disproportionately at risk for obesity.

In sum, weight discrimination is a significant public health concern that contributes to psychological distress and may reduce weight loss treatment efficacy. Moreover, the associations between weight discrimination and treatment outcomes were observed among Black and White adults, and Black adults with prior weight discrimination may attend treatment less. Additional research is needed to understand the intersectional relationships between weight discrimination and race in more diverse treatment populations. To improve intervention efficacy, obesity treatment programs should consider how weight discrimination may impact the mental health of those seeking treatment for obesity, while bolstering self-efficacy necessary for long-term weight management.

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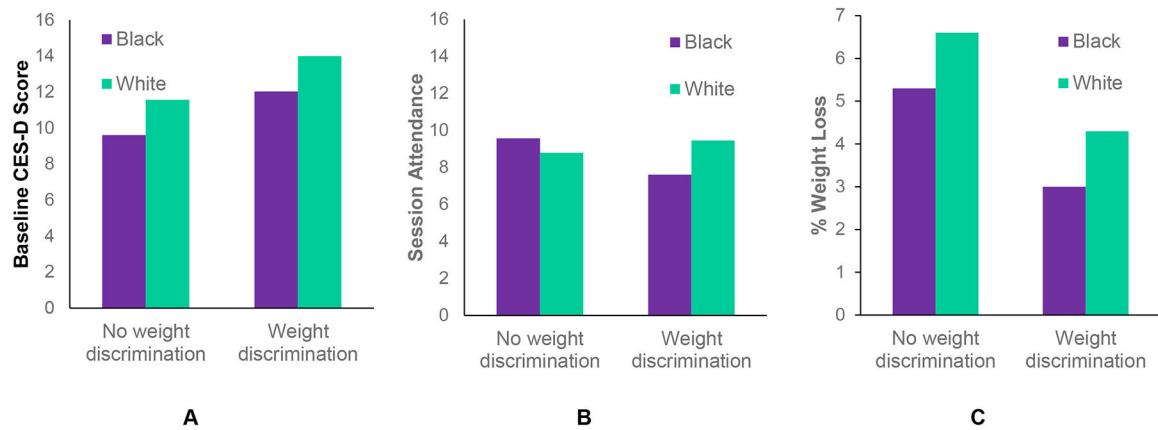
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### **Statement Regarding Ethical Approval and Informed Consent**

The present study is a secondary data analysis of a behavioral weight loss intervention study involving human subjects. All procedures were performed in accordance with the ethical standards of the institutional review board and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All participants engaged in the present study were provided with information on the study's purpose, risks and benefits of participation, and measures for protecting their confidentiality. Participants provided written informed consent after agreeing to study procedures.



**Figure 1.**

Relationship between history of perceived weight discrimination and race estimated at mean age, female sex, mean baseline BMI with **A**) depressive symptoms, **B**) treatment session attendance, and **C**) % weight change.\* **A** shows significant main effects of weight discrimination and race on depressive symptoms, but no interaction. **B** shows an interaction between weight discrimination and race on session attendance. **C** shows a main effect of weight discrimination on % weight change, but no main effect for race and no interaction. \*Participants lost weight on average, y-axis show % weight loss for presentation of positive values.

**Table 1.**

Participant characteristics (N=271) and comparisons of Black and White adults enrolled in a 16-week weight loss intervention.

Characteristic	Full sample	Black race (n= 157)	White race (n= 107)	t-test or $\chi^2$ , p-value
	M (SD), Range or n (%)	M (SD), Range or n (%)	M (SD), Range or n (%)	
Age	48.6 (12.4), 23–77	45.6 (10.8), 25–74	53.5 (13.0), 23–77	<0.001
Female Sex	250 (92%)	150 (96%)	94 (88%)	0.020
Black Race	157 (59%)	---	---	---
Married	140 (52%)	71 (45%)	64 (60%)	0.020
Bachelor's Degree or higher education	160 (59%)	85 (54%)	69 (64%)	0.094
Income(<=\$40,000; \$40,000 – \$80,000; >=\$80,000)	92 (34%); 108 (40%); 70 (26%)	62 (39%); 64 (41%); 31 (20%)	27 (25%); 43 (40%); 37 (35%)	0.010
Baseline BMI	35.7 (4.5), 28.1–46.7	36.2 (4.4), 28.1–46.7	35.1 (4.5), 28.4–45	0.041
History of Weight Discrimination	93 (34%)	45 (29%)	44 (41%)	0.036
CES-D total score	10.4 (7.4), 0–48	9.8 (7.2), 0–48	11.0 (7.4), 0–34	0.207
Weight Loss Intervention Session Attendance	9.2 (5.0), 1–16	8.9 (5.0), 1–16	9.6 (4.9), 1–16	0.305
% Weight Change *	–5.8% (4.2%), –20.9% -- +6.9%	–5.2% (3.8%), –14.9%-- +5.9%	–6.6% (4.7%), –20.9%-- +6.9%	0.047

BMI: Body mass index; CES-D: Centers for Epidemiological Studies Depression Scale

\* Calculated for n=165 who completed follow-up assessments



**Table 2.**

Characteristics of participants who completed and did not complete the 16-week intervention.

Characteristic	Completers (n= 165)	Non-completers (n= 106)	t-test or $\chi^2$ , p-value
	M (SD), Range or n (%)	M (SD), Range or n (%)	
Age	50.4 (12.9), 26–75	45.9 (11.1), 23–77	0.004
Female Sex	157 (95%)	93 (88%)	0.026
Black Race	92 (58%)	65 (63%)	0.419
Married	85 (52%)	55 (52%)	0.952
Bachelor's Degree or higher education	102 (62%)	58 (55%)	0.246
Income(<=\$40,000; \$40,000 – \$80,000; >=\$80,000)	53 (32%); 67 (41%); 45 (27%)	39 (37%); 41 (39%); 25 (24%)	0.667
Baseline BMI	35.3 (4.3), 28.1–44.6	36.4 (4.7), 29.1–46.7	0.050
History of Weight Discrimination	54 (33%)	39 (37%)	0.492
CES-D total score	10.0 (7.7), 0–48	11.0 (6.9), 0–34	0.265
Weight Loss Intervention Session Attendance	12.4 (3.0), 3–16	4.1 (2.8), 1–14	<0.001
% Weight Change*	–5.8% (4.2%), –20.9%–+6.9%	---	---

BMI: Body mass index; CES-D: Centers for Epidemiological Studies Depression Scale

**Table 3.**

Associations between weight discrimination and depressive symptoms, session attendance, and percent weight change.

<b>Outcome: Depressive Symptoms</b>			
<b>Model Variable</b>	<b>B</b>	<b>95% CI</b>	<b>p-value</b>
Weight Discrimination	<b>2.432</b>	0.543, 4.320	0.012
Baseline BMI	0.055	-0.144, 0.254	0.585
Black Race	<b>-1.960</b>	-3.858, -0.061	0.043
Age	<b>-0.123</b>	-0.196, -0.049	0.001
Female Sex	1.008	-2.274, 4.290	0.546
<b>Outcome: Session Attendance *</b>			
<b>Model Variable</b>	<b>B</b>	<b>95% CI</b>	<b>p-value</b>
Weight Discrimination	-0.088	-0.234, 0.059	0.240
Baseline BMI	-0.010	-0.025, 0.006	0.228
Black Race	-0.021	-0.166, 0.123	0.771
Age	<b>0.008</b>	0.002, 0.013	0.009
Female Sex	0.200	-0.070, 0.469	0.146
<b>Outcome: % Weight Change **</b>			
<b>Model Variable</b>	<b>B</b>	<b>95% CI</b>	<b>p-value</b>
Weight Discrimination	<b>0.023</b>	0.009, 0.038	0.002
Baseline BMI	<0.001	-0.002, 0.001	0.901
Black Race	0.013	0, 0.028	0.064
Age	<.001	-0.001, 0	0.140
Female Sex	0.006	-0.026,0.037	0.716

BMI: Body mass index

\* Quasi-Poisson regression was used for count variable

\*\* Calculated for n=165 who completed follow-up assessments