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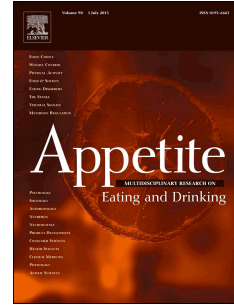
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# Accepted Manuscript

Internalized Weight Stigma Moderates Eating Behavior Outcomes in Women with High BMI Participating in a Healthy Living Program

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1 Running head: INTERNALIZED WEIGHT STIGMA MODERATES EATING BEHAVIOR

2  
3 **Internalized Weight Stigma Moderates Eating Behavior Outcomes**  
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36 Abstract

37 Weight stigma is a significant socio-structural barrier to reducing health disparities and  
38 improving quality of life for higher weight individuals. The aim of this study was to examine the  
39 impact of internalized weight stigma on eating behaviors after participating in a randomized  
40 controlled trial comparing the health benefits of a weight-neutral program to a conventional  
41 weight-management program for 80 community women with high body mass index (BMI > 30,  
42 age range: 30-45). Programs involved 6 months of facilitator-guided weekly group meetings  
43 using structured manuals. Assessments occurred at baseline, post-intervention (6 months), and  
44 24-months post-randomization. Eating behavior outcome measurements included the Eating  
45 Disorder Examination-Questionnaire and the Intuitive Eating Scale. Intention-to-treat linear  
46 mixed models were used to test for higher-order interactions between internalized weight stigma,  
47 group, and time. Findings revealed significant 3-way and 2-way interactions between  
48 internalized weight stigma, group, and time for disordered and adaptive eating behaviors,  
49 respectively. Only weight-neutral program participants with low internalized weight stigma  
50 improved global disordered eating scores. Participants from both programs with low internalized  
51 weight stigma improved adaptive eating at 6 months, but only weight-neutral program  
52 participants maintained changes at follow-up. Participants with high internalized weight stigma  
53 demonstrated no changes in disordered and adaptive eating, regardless of program. In order to  
54 enhance the overall benefit from weight-neutral approaches, these findings underscore the need  
55 to incorporate more innovative and direct methods to reduce internalized weight stigma for  
56 women with high BMI.

57 **Key Words:** internalized weight stigma, disordered eating, intuitive eating, obesity,  
58 health at every size, conventional weight-management

59

## 60 Introduction

61 Widespread concerns over the “obesity epidemic” have dominated the scientific literature  
62 on weight for the greater part of the 21<sup>st</sup> Century. A consequence of this increased attention on  
63 obesity is a pervasive stigmatization of people with a higher weight status—a stigmatization that  
64 is on the rise among adults and children (Andreyeva, Puhl, & Brownell, 2008; Harriger,  
65 Calogero, Witherington, & Smith, 2010; Latner & Stunkard, 2003). Indeed, weight  
66 discrimination has been well-documented in educational, workplace, and healthcare settings  
67 (e.g., Giel, Thiel, Teufel, Mayer, & Zipfel, 2010; Neumark-Sztainer, Story, & Harris, 1999; Puhl  
68 & Latner, 2007; Puhl, Latner, King, & Luedicke, 2014; Puhl, Luedicke, & Heuer, 2011; Puhl &  
69 Peterson, 2014; Ruggs, Hebl, & Williams, 2015; Sabin, Marini, & Nosek, 2012). Even  
70 healthcare professionals who have chosen a career path specializing in the medical management  
71 of obese patients demonstrate anti-fat attitudes, as assessed implicitly in laboratory research  
72 (Schwartz, Chambliss, Brownell, Blair, & Billington, 2003). Given these data, it is no surprise  
73 that higher weight individuals report avoiding preventive healthcare and suffer from receiving  
74 suboptimal medical treatment (Phelan et al., 2015; Wee, McCarthy, Davis, & Phillips, 2000).

75 Weight-neutral approaches to promote health, actively attempt to reduce the perpetuation  
76 of weight stigma and promote size acceptance by shifting the focus of interventions away from  
77 weight loss (i.e., typical of conventional weight-management programs) to well-being and self-  
78 care, regardless of weight status (Tylka et al., 2014). Notably, Health at Every Size® (HAES)  
79 models characterize the weight-neutral approach (Bacon, 2010; Bombak, 2014; O'Hara & Gregg,  
80 2014; Robison, Putnam, & McKibbin, 2007), and studies that have tested weight-neutral  
81 programs demonstrated improvements (compared to baseline values) in many physical health,  
82 eating, and well-being indices such as: lower total cholesterol, low-density lipoprotein  
83 cholesterol, triglycerides, systolic blood pressure, disinhibited eating, bulimic symptomatology,

84 drive for thinness, body dissatisfaction, poor interoceptive awareness, and depression (e.g.,  
85 Bacon et al., 2002; Bacon, Stern, Van Loan, & Keim, 2005; Mensinger, Calogero, Stranges, &  
86 Tylka, 2016; for reviews, see Cadena-Schlam & Lopez-Guimera, 2014; Clifford et al., 2015; and  
87 Schaefer & Magnuson, 2014). Although this body of research demonstrated effectiveness for  
88 weight-neutral programs, what is less clear is whether there are moderators that strengthen or  
89 weaken their effectiveness. Moderators answer the question of *when* or *for whom* a given  
90 relationship exists or an effect occurs (Karazsia, van Dulmen, Wong, & Crowther, 2013).

91         One such mechanism that has received substantial attention and could act as a moderator  
92 of weight-neutral programs' effectiveness is internalized weight stigma. *Internalized weight*  
93 *stigma* refers to the adoption and personal endorsement of negative weight-based societal  
94 stereotypes (Carels et al., 2013; Durso & Latner, 2008; Tylka et al., 2014). Individuals with high  
95 internalized weight stigma judge themselves based on these very stereotypes (Pearl, Puhl, &  
96 Dovidio, 2014)—thus, they assume personal responsibility for their weight and view their bodies  
97 as unattractive and in need of modification due to their size. This self-judgment may prompt  
98 additional body shame and body hatred, which may then result in decreased psychological well-  
99 being and physical health (Durso et al., 2012; Muennig, 2008; Wirth, Blake, Hebert, Sue, &  
100 Blair, 2014). Preliminary evidence suggests that individuals with greater internalized weight  
101 stigma report lower engagement in physical activity (Carels et al., 2009; Pearl et al., 2014;  
102 Vartanian & Novak, 2011), higher caloric intake during weight loss programs (Carels et al.,  
103 2009; Schvey, Puhl, & Brownell, 2011), and greater eating disorder symptomatology (Carels,  
104 Wott, Young, et al., 2010; Durso et al., 2012; Puhl, Moss-Racusin, & Schwartz, 2012; Schvey,  
105 Roberto, & White, 2013; Schvey & White, 2015)—all of which may interfere with the  
106 effectiveness of health promotion programs. It is plausible, then, that internalized weight stigma  
107 poses a barrier to receiving the full benefit from participating in such programs.

108 To evaluate this proposition, the present study examined internalized weight stigma as a  
109 moderator of the effectiveness of a weight-neutral program and a conventional weight-  
110 management program for women of high BMI, with a particular focus on their eating behavior  
111 outcomes. More specifically, we predicted that women with high internalized weight stigma  
112 would be less likely to benefit from a weight-neutral program than those with low internalized  
113 weight stigma. Indeed, women with high internalized weight stigma may find it harder to engage  
114 in adaptive eating behaviors as well as harder to disengage from disordered eating if they have  
115 internalized societal weight-based stereotypes and therefore blame themselves for their high  
116 weight. Furthermore, without a special focus on interventions for reducing internalized weight  
117 stigma, implementing size acceptance principles characteristic of weight-neutral programs may  
118 be particularly challenging to this subset of people with high BMI. In contrast, conventional  
119 weight-management programs promise a method of escaping the stigmatized group through  
120 dietary prescriptions and lifestyle modifications that assure weight loss. Therefore, we predicted  
121 those with high internalized weight stigma in a conventional weight-management program may  
122 not differ as much in their changes in eating behaviors compared to their low internalized weight  
123 stigma counterparts.

124 In summary, to test these assertions, three specific hypotheses were examined: (a)  
125 internalized weight stigma would have a more negative impact on eating behaviors over time in  
126 the weight-neutral program compared to the conventional weight-management program; (b)  
127 participants with high levels of internalized weight stigma would see smaller declines in  
128 disordered eating and less improvement in adaptive eating over time compared to those low in  
129 internalized weight stigma, regardless of intervention; and (c) participants in the weight-neutral  
130 program would experience greater declines in disordered eating and larger improvements in  
131 adaptive eating behaviors than those in the conventional weight-management program. In

132 addition, change in internalized weight stigma between and within both programs from baseline  
133 to post-treatment and follow-up was explored. If either program is able to reduce participants'  
134 internalized weight stigma directly, then additional support would be accrued for the program's  
135 clinical relevance.

## 136 **Materials and Methods**

### 137 **Design and Procedure**

138 Participants for this longitudinal, randomized controlled trial were recruited from a  
139 suburban community setting in Southeastern Pennsylvania in late Fall 2008 through a local  
140 coupon magazine advertisement, flyers placed in physicians' offices, and the sponsoring  
141 hospital's website. Research staff conducted phone screens with interested study applicants to  
142 determine preliminary eligibility. If they met the initial criteria, applicants were instructed to  
143 consult their primary care physician to obtain a signature on a requisite clearance form that  
144 described the study and its eligibility criteria. They then attended an intake session with a trained  
145 research assistant who garnered participants' informed consent and ascertained participants' BMI  
146 by measuring body weight and height without shoes using a Detecto balance beam scale and a  
147 wall-mounted stadiometer to the nearest 0.1 kilogram and 0.1 centimeter, respectively.

148 At the end of the baseline assessment, study participants were handed a sequentially  
149 numbered envelope containing a randomly assigned intervention group (1:1 ratio), a welcome  
150 letter, and instructions regarding the study. Follow-up assessments occurred immediately post-  
151 intervention (6 months) and at 24-months post-randomization. Incentives of \$20 were provided  
152 for attending follow-up assessments. Research technicians with health science training (nurses  
153 and public health backgrounds) collected study measurements for all time points in the  
154 laboratory of the Clinical Research Center at the sponsoring hospital. Although self-report  
155 measures were used, study personnel read the questions to participants, and participants' answers



156 were provided orally in a structured interview-like format, in order to ensure clarity of all  
157 questions and completeness of the data. The study protocol and procedures were approved and  
158 monitored by the Institutional Review Board of the Reading Health System.

### 159 **Eligibility Criteria**

160 To be eligible for the study, participants had to be female, between 30 and 45 years old,  
161 have a BMI between 30 and 45 kg/m<sup>2</sup>, practice birth control if heterosexual and pre-menopausal,  
162 and be physically inactive (i.e., scoring in either the ‘inactive’ or ‘light intensity activity’  
163 categories on the Stanford Brief Activity Survey; Taylor-Piliae et al., 2006). Women were  
164 excluded if they were current smokers, were not fluent in English, were taking medications  
165 known to affect weight, were presently participating in a weight loss program, were pregnant or  
166 intending to become pregnant, had type 1 or insulin-dependent type 2 diabetes, had or were  
167 planning to have bariatric surgery, had an active neoplasm, or had a history of myocardial  
168 infarction, congestive heart failure, cerebrovascular disease, renal disease, or cirrhosis. Specific  
169 psychological contraindications that also warranted exclusion were a diagnosis of bulimia  
170 nervosa, anorexia nervosa, or substance abuse, and psychiatric disturbances that significantly  
171 disrupted daily functioning (e.g., suicidal ideation, current manic episode, schizophrenia).

172 A total of 80 women were enrolled in the study after screening 252 women for  
173 eligibility. Based on the screening, 110 women did not meet the eligibility criteria listed above.  
174 A further 60 women were excluded because they were unable to commit to attend the weekly  
175 evening group on Wednesdays due to a conflict with pre-existing commitments on that day of  
176 the week. Two additional women were excluded because they missed the deadline for submitting  
177 their clearance form from their physicians. A total of 72 participants were available for  
178 assessment at the 6-month assessment and 40 participants were available at the 24-month  
179 assessment. Figure 1 displays the flow of participant involvement for the duration of the study.

**180 Interventions**

181           Forty women were randomly assigned to the weight-neutral program, and 40 women  
182 were randomly assigned to the conventional weight-management program. Participants within  
183 each program were divided into two cohorts of 20. Both cohorts for each program met weekly  
184 for 90-minute sessions, held simultaneously on a weekday evening for the duration of 6 months.  
185 The cohort sizes were based on recommendations by the developers of the program protocols  
186 and consultations with the group facilitators prior to the commencement of the study. Both  
187 facilitators had previous experience working with psychoeducational groups of up to 20  
188 individuals. The length of the interventions, intensity of the interventions, resources provided to  
189 participants, and the expertise of the facilitators (i.e., in the focus of the respective interventions)  
190 were equivalent between the programs.

191           Participants in the weight-neutral program received the *HUGS Program for Better Health*  
192 (Omichinski, 2007), which stands for **H**Health-focused, **U**nderstanding lifestyle, **G**roup supported,  
193 and **S**elf-esteem building. HUGS is a holistic health promotion program that follows an  
194 evidence-based (Omichinski, 1995) manualized curriculum (Omichinski, 2007) incorporating the  
195 main components of popular weight-neutral programs such as Health at Every Size® (Bacon,  
196 2010). Although the weight-neutral program underscored the HAES® tenets (ASDAH, 2015;  
197 Tylka et al., 2014) and emphasized the appreciation of body size diversity and size acceptance,  
198 the curriculum did not *directly* address internalized weight stigma. HUGS also taught the  
199 principles of eating for well-being *and* pleasure, and engaging in physical activity for personal  
200 enjoyment and fulfillment. A key aim of this program was to help participants break away from a  
201 dieting mindset that often leads to a vicious cycle of bingeing and guilt due to an overly  
202 restrictive lifestyle (Polivy & Herman, 1985; van Strien, Herman, & Verheijden, 2014).  
203 Participants received the books *Staying Off of the Diet Roller Coaster* (Omichinski, 2000) and

204 *Tailoring Your Tastes* (Omichinski & Hildebrand, 1995), in addition to a booklet of handouts  
205 including psycho-educational worksheets (e.g., exploring hunger with a hunger rating scale,  
206 discerning emotional from physical hunger), and a set of affirmation CDs produced by HUGS  
207 Inc. Each week participants were encouraged to further explore topics they discussed within their  
208 group sessions on their own at home. For example, participants completed assigned readings  
209 from the books, wrote positive affirmations about themselves and their changing daily routines to  
210 bring back and share with the group the following week, kept a food and feelings journal in order  
211 to reconnect with hunger and satiety cues, and engaged in new and enjoyable physical activities.  
212 At the end of the 6 months, participants were encouraged to maintain their non-dieting lifestyles  
213 and self-affirming attitudes about their bodies by utilizing the social support network developed  
214 during the program. Email and phone number lists were created and distributed in both cohorts to  
215 help facilitate this network. This program was delivered by a psychotherapist and fitness  
216 professional with over 15 years of experience in providing health-centered, HAES®-oriented  
217 approaches for clients with high BMI within individual and group settings.

218 Participants in the conventional weight-management program received the *LEARN*  
219 *Program for Weight Management*, which stands for **L**ifestyle, **E**xercise, **A**ttitudes, **R**elationships,  
220 and **N**utrition (Brownell, 2000). This evidence-based behavior modification curriculum  
221 emphasizes weight loss as an ultimate goal of the program, while focusing on gaining skills to  
222 overcome weight loss barriers, and, learning how to change diet and lifestyle. The LEARN  
223 program has been referred to as the gold standard for weight-management programs (Gardner et  
224 al., 2007; Womble et al., 2004). Participants in the LEARN program received the 10<sup>th</sup> edition of  
225 the *LEARN Program for Weight Management* manual (Brownell, 2000) and the *LEARN Weight*  
226 *Stabilization and Maintenance Guide* (Brownell, 2008) along with the LEARN Program CD set.  
227 In addition to maintaining food diaries and physical activity logs between the scheduled program

228 meetings each week, participants were expected to complete exercises from the manual.  
229 Examples of the exercises included: (a) a self-assessment of eating risk factors, (b) a worksheet  
230 to prepare one with coping skills for “high risk situations” that might lead to overeating, (c) an  
231 eating habits checklist, (d) a nutrition quiz, and (e) an exercise quiz. As with the weight-neutral  
232 program, at the end of the 6-month program, participants in the conventional weight-  
233 management program were encouraged to maintain their lifestyle changes by utilizing the social  
234 support network developed during the program. Email and phone number lists were created and  
235 distributed in both cohorts to help facilitate this network. This program was delivered by a  
236 registered dietician with over 15 years of experience working with bariatric populations and  
237 patients with type 2 diabetes within individual and group settings.

238         The two programs shared many common principles in that both emphasized the  
239 importance of healthy lifestyle choices and gradual sustainable change. However, the  
240 conventional weight-management program made weight loss an explicit goal and focused on  
241 food intake levels based on external prescriptions and caloric restriction. In contrast, the weight-  
242 neutral program taught size acceptance, self-care, and strategies to recognize and respond to  
243 physiological signs of hunger and satiety to determine food intake. We ensured fidelity of the  
244 programs by using checklists derived from the leaders’ manuals and randomly selecting  
245 approximately 20% of the sessions for audit by a trained staff member from the Reading Health  
246 System Clinical Research Center.

#### 247 **Measures**

248         **Adaptive eating.** We defined adaptive eating as *intuitive eating*, or eating mainly in  
249 response to physiological hunger and satiety cues—those who eat intuitively are attuned to and  
250 trust their hunger and satiety signals to guide their eating (Tylka, 2006). Intuitive eating has been  
251 described as a flexible and adaptive eating behavior (Tribole & Resch, 2012). We assessed this

252 eating style using Tylka's (2006) original Intuitive Eating Scale (IES), as the updated IES-2  
253 (Tylka & Kroon Van Diest, 2013) was not yet published. The IES contains 21 items that are  
254 rated along a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items assess  
255 one's ability to: (a) recognize and trust hunger and satiety cues, (b) eat in accordance to physical  
256 rather than emotional cues, and (c) give oneself unconditional permission to eat. While subscale  
257 scores can be generated, we averaged the 21 items to create an overall composite score, as  
258 recommended by Tylka (2006). The IES has been found to show evidence of reliable and valid  
259 scores among college students, indicating a higher-order factor structure (Tylka, 2006), as well  
260 as among community-based samples of women (Tylka, Lumeng, & Eneli, 2015). Cronbach's  
261 alpha for the the IES in the present sample was .76.

262       **Disordered eating.** Disordered eating attitudes and behaviors were measured using the  
263 Eating Disorder Examination Questionnaire (EDE-Q) version 6.0 (Fairburn & Cooper, 2008;  
264 Fairburn, Cooper, & O'Connor, 2008). The EDE-Q is a 28-item measure based on the Eating  
265 Disorder Examination interview (Cooper & Fairburn, 1987). EDE-Q scores were conceptualized  
266 along a continuum of degree, whereby progressively higher scores correspond to progressively  
267 higher levels of eating psychopathology; support for this dimensional approach can be found in  
268 Tylka (2004) and Tylka and Subich (1999). Because participants were excluded on the basis of a  
269 diagnosis of bulimia nervosa or anorexia nervosa, a clinical cut-off score was determined to not  
270 be useful and therefore not calculated in the present study. The EDE-Q consists of four subscales  
271 (Restraint, Eating Concern, Weight Concern, and Shape Concern) that are summed and averaged  
272 to obtain a total composite index of global eating disturbance, as was done in the present study.  
273 Participants are asked to rate the frequency with which they experience a series of behaviors and  
274 cognitions that are characteristic of disordered eating over the past 28 days on a 7-point scale (0  
275 = *no days*, 1 = *1-5 days*, 2 = *6-12 days*, 3 = *13-15 days*, 4 = *16-22 days*, 5 = *23-27 days*, 6 =

276 *every day*). The EDE-Q has been validated in large population-based samples of community  
277 women and demonstrates sound psychometric properties within these samples (Hilbert, de  
278 Zwaan, & Braehler, 2012; Mond, Hay, Rodgers, & Owen, 2006; Mond, Hay, Rodgers, Owen, &  
279 Beumont, 2004). Cronbach's alpha for the global EDE-Q in the present sample was .80.

280 **Internalized weight stigma.** We used the Weight Bias Internalization Scale (WBIS;  
281 Durso & Latner, 2008) to measure participants' levels of internalized weight stigma. The WBIS  
282 contains 11 items that are rated on a 7-point Likert scale ranging from *strongly disagree* (scored  
283 as 1) to *strongly agree* (scored as 7). Items are averaged, with higher scores indicating higher  
284 internalized weight stigma. In a sample of community women and men who were classified as  
285 overweight or obese, scores on the WBIS demonstrated internal consistency reliability and  
286 construct (i.e., convergent, incremental) validity (Durso & Latner, 2008). Cronbach's alpha for  
287 the WBIS was .84 in the present sample.

## 288 **Data Analysis**

289 Statistical tests were performed in SPSS (Version 22.0, Armonk, NY: IBM Corp.). Using  
290 independent samples *t*-tests for continuous variables and chi-square tests for categorical variables  
291 (e.g., race/ethnicity, marital status), study non-completers were compared to study completers on  
292 all baseline levels of the outcome variables as well as the participant demographic characteristics  
293 reported in Table 1 in order to determine how attrition may have influenced the findings. We  
294 applied linear mixed models with the intention-to-treat principle to test the primary hypotheses:  
295 (a) a third order interaction effect (group  $\times$  time  $\times$  internalized weight stigma); (b) a second-order  
296 interaction effect (internalized weight stigma  $\times$  time); and (c) a second-order interaction effect of  
297 the group differences in mean changes in the outcomes over time (group  $\times$  time). In addition to  
298 testing these hypotheses, the models provided estimates for the between-group differences in  
299 change from baseline to 6-month and 24-month assessments, the within-group effects of time

300 (including *post hoc* comparisons using the Least Significance Difference test), and the main  
301 effect of internalized weight stigma on disordered and adaptive eating behaviors. Internalized  
302 weight stigma was also explored over time with an intention-to-treat linear mixed model  
303 examining the within and between-group effects as well as the group by time interaction effect.  
304 The compound symmetry assumption was used to fit the covariance matrices for the models.  
305 Sample size determination was based on data from a previous trial comparing a weight-neutral to  
306 a conventional weight-management intervention with 78 obese women and a 50% attrition rate at  
307 the 24-month follow-up (Bacon et al., 2005). We determined that with 20 participants per  
308 intervention by long-term follow-up, we would have adequate power (.80) to detect differences  
309 of a moderate effect size.

310 Higher-order interaction effects were descriptively probed using the standard “pick-a-  
311 point” approach that was developed for fixed effects regression models (Rogosa, 1980; Aiken &  
312 West, 1991) and further extended to multi-level, or growth-curve models with subject-specific  
313 random effects (Bryk & Raudenbush, 1987; Willet, Singer, & Martin, 1998). Trajectories of  
314 change depicting individuals who scored 1 standard deviation (*SD*) above the mean on  
315 internalized weight stigma and those who scored 1 *SD* below the mean were used as anchors on  
316 the graphs.

### 317 **Results**

318 Table 1 displays the baseline sample characteristics grouped by program. No significant  
319 differences were demonstrated between the programs on any of the measures (all *ps* > .05),  
320 indicating that the randomization was successful in creating adequately comparable groups.  
321 At 6 months (immediately after the program ended), 90% of the participants were available for  
322 assessments. At 24 months, 50% of the participants were available for follow-up assessments.  
323 Attrition analyses indicated no differences between the completers and non-completers on any of

324 the baseline scores for the outcome variables or demographic characteristics, with the exception  
325 of race/ethnicity. Of the five participants who identified as a racial minority, none completed the  
326 24-month assessment (Fisher's Exact Test;  $p = .055$ ). To further ensure that attrition had no  
327 impact on the present findings, we entered a dropout variable into the linear mixed models;  
328 results were unchanged after doing so.

329 Table 2 reports the estimated marginal means at baseline, 6 months, and 24 months from  
330 the intention-to-treat linear mixed analyses for each outcome variable<sup>1</sup>. These values are based  
331 on models that include the main effects for internalized weight stigma (WBIS scores), group  
332 (weight-neutral program versus conventional weight-management program), time (baseline, 6  
333 months, 24 months), as well as all 2-way interactions (group  $\times$  time; group  $\times$  internalized weight  
334 stigma; time  $\times$  internalized weight stigma), and the 3-way (group  $\times$  time  $\times$  internalized weight  
335 stigma) interaction effect on these variables. When internalized weight stigma was the outcome,  
336 the model included the group and time main effects as well as the group by time interaction. All  
337 models also examined between-group differences in change from baseline to 6 months and 24  
338 months, as well as the within-group effects of time. Table 2 reports the  $F$ -statistics,  $p$ -values,  
339 parameter estimates, and 95% confidence intervals for all of the effects reported below.

#### 340 **Adaptive Eating**

341 For the first hypothesis, the 3-way interaction effect between group, time, and  
342 internalized weight stigma trended towards significance, suggesting that the influence of  
343 internalized weight stigma on adaptive eating was marginally different for the two programs. The  
344 second hypothesis was supported by the significant 2-way interaction between internalized  
345 weight stigma and time, suggesting that internalized weight stigma influenced the degree to  
346 which participants changed their adaptive eating behaviors over the course of the study,  
347 regardless of program type.



348 To interrogate the meaning of the interactions involving internalized weight stigma, we  
349 plotted a graph utilizing the model's parameter estimates to demonstrate the changes in adaptive  
350 eating between women with high (1 *SD* above the mean) internalized weight stigma and low (-1  
351 *SD* below the mean) internalized weight stigma for each program over the time points. Figure 2  
352 demonstrates that women with high internalized weight stigma in both programs did not  
353 demonstrate improvements in adaptive eating at the 6-month or 24-month assessments. In  
354 contrast, women with low internalized weight stigma reported improved adaptive eating at the 6-  
355 month assessment (internalized weight stigma  $\times$  time effect). The significant 3-way interaction  
356 effect (group  $\times$  time  $\times$  internalized weight stigma) provides evidence that of the individuals with  
357 low internalized weight stigma, the greatest improvement occurred among women in the weight-  
358 neutral program.

359 The third hypothesis was also supported by the significant 2-way interaction between  
360 group and time, suggesting that changes in adaptive eating behaviors over time were different  
361 according to the assigned program. Significant between-group differences in mean change from  
362 baseline were found at post-intervention for adaptive eating behaviors. Specifically, the  
363 improvement in adaptive eating behaviors was greater in the weight-neutral program compared  
364 to the conventional weight-management program between the baseline and 6-month assessment  
365 ( $t = -2.60, p = .011$ ). At the 24-month assessment, the mean difference in change from baseline  
366 was no longer significantly different between the two programs for adaptive eating ( $t = -1.38, p =$   
367  $.169$ ).

368 Within-group effects of time for adaptive eating were evident in both programs. Overall  
369 improvements between baseline and the 6-month assessment were demonstrated for the weight-  
370 neutral program ( $p < .001$ ) and conventional weight-management program ( $p = .008$ ). However,  
371 only the weight-neutral program participants sustained improvements above baseline levels at

372 the 24-month assessment (weight-neutral  $p = .001$  vs. conventional weight-management  $p =$   
373 .462).

#### 374 **Disordered Eating**

375 **Global EDE-Q scores.** For the first hypothesis, the 3-way interaction between group,  
376 time, and internalized weight stigma was statistically significant, indicating that the influence of  
377 internalized weight stigma on global disordered eating over time was not equivalent for the two  
378 programs. The second hypothesis was supported by the significant 2-way interaction between  
379 internalized weight stigma and time, suggesting that internalized weight stigma influenced the  
380 degree to which participants decreased disordered eating behaviors over the course of the study  
381 regardless of assigned program.

382 To interrogate the meaning of the interaction effects involving internalized weight  
383 stigma, we plotted a graph utilizing the model's parameter estimates to depict how women with  
384 high (1 *SD* above the mean) internalized weight stigma compared to women with low (-1 *SD*  
385 below the mean) internalized weight stigma on disordered eating behaviors within each program.  
386 Figure 3 reveals that women with high internalized weight stigma did not show reductions in  
387 disordered eating at the 6-month or 24-month assessment, regardless of the assigned program. In  
388 comparison, women with low internalized weight stigma did show reductions in disordered  
389 eating at the 6-month assessment (internalized weight stigma  $\times$  time effect), with the largest  
390 decrements observed for women with low internalized weight stigma within the weight-neutral  
391 program, providing support for the first hypothesis (group  $\times$  time  $\times$  internalized weight stigma  
392 effect). The difference in mean change for the weight-neutral program from baseline to the 6-  
393 month assessment for high versus low internalized weight stigma was 1.32, while the difference  
394 in mean change for the conventional weight-management program from baseline to the 6-month  
395 assessment was 0.40. Notably, the 6-month assessment mean for women with lower than average

396 internalized weight stigma within the weight-neutral program was 0.50 *SD* units *below* the global  
397 EDE-Q mean derived from age and sex equivalent population norms (women between 33-37  
398 years-old; Mond et al., 2006) and 1.56 *SD* units below the global EDE-Q mean derived from a  
399 population-based community sample of women between the ages of 16 and 50 with a BMI >30  
400 (Rø, Reas, & Rosenvinge, 2012).

401 The third hypothesis was also supported by the significant 2-way interaction between  
402 group and time, suggesting that changes in disordered eating behaviors over time were different  
403 according to the assigned program. Specifically, women in the weight-neutral program  
404 demonstrated significantly greater reductions in disordered eating than women in the  
405 conventional weight-management program between baseline and the 6-month assessment ( $t =$   
406  $3.36, p = .001$ ); however, these differences between the programs were no longer significant at  
407 the 24-month assessment ( $t = 1.31, p = .194$ ).

408 Within-group effects of time for global disordered eating scores were evident only in the  
409 weight-neutral program. Participants reported reductions in global disordered eating at the 6-  
410 month assessment ( $p < .001$ ), and these reductions were sustained at the 24-month assessment ( $p$   
411  $= .001$ ).

412 **EDE-Q subscales.** In order to further understand the patterns of change and provide  
413 context for the overall findings in global disordered eating, we conducted a supplementary  
414 analysis for each EDE-Q-subscale as an outcome in lieu of the total global disordered eating  
415 score. As reported in Table 2, the 3-way interaction effect for group, time, and internalized  
416 weight stigma as well as the 2-way interactions between time and internalized weight stigma on  
417 the Weight Concern and Shape Concern subscales closely align with the results for global  
418 disordered eating. Although the group by time interaction effects for Weight Concern and Shape  
419 Concern were not significant, there was a strong group by time interaction for the Restraint

420 subscale. Whereas Restraint scores in the conventional weight-management program  
421 significantly increased (hence become more disordered), those in the weight-neutral program did  
422 not change over the course of the study. The 3-way interaction effect was not significant for the  
423 Eating Concerns subscale, suggesting that the effect of internalized weight stigma did not differ  
424 between the weight-neutral program and the conventional weight-management program.  
425 However, both hypothesized 2-way interactions (internalized weight stigma  $\times$  time, group  $\times$   
426 time) trended towards significance for Eating Concerns.

### 427 **Internalized Weight Stigma**

428 In addition to the tests of the main hypotheses, we also explored whether there was a  
429 group by time interaction effect for internalized weight stigma, and examined the associated  
430 between-group and within-group effects of time (see Figure 4 and bottom section of Table 2).  
431 The group by time interaction effect did not reach statistical significance, and there were no  
432 between-group differences in mean changes from baseline to the 6-month or 24-month  
433 assessment. Within-group effects of time were evident in both the weight-neutral program and  
434 the conventional weight-management program. Overall improvements in internalized weight  
435 stigma between baseline and the 6-month assessment were reported by those in the weight-  
436 neutral program ( $p < .001$ ) and those in the conventional weight-management program ( $p <$   
437  $.001$ ). These positive changes in internalized weight stigma were further sustained at the 24-  
438 month assessment for the weight-neutral program ( $p < .001$ ) and the conventional weight-  
439 management program ( $p = .010$ ). The difference between the means in internalized weight  
440 stigma was negligible at baseline (Cohen's  $d = 0.21$ ), but large effect sizes were noted between  
441 the programs at the 6-month assessment (Cohen's  $d = -1.73$ ) and the 24-month assessment  
442 (Cohen's  $d = -2.00$ ). The means of the weight-neutral program were lower than the means of the  
443 conventional weight-management program in the two latter assessments.

444 **Discussion**

445 This study examined the moderating effect of internalized weight stigma on eating  
446 behavior outcomes over time when comparing a weight-neutral program to a conventional  
447 weight-management program for women with high BMI. Women with high levels of internalized  
448 weight stigma showed less improvement in their eating behaviors (i.e., adaptive eating and  
449 disordered eating) regardless of intervention type, whereas women with low internalized stigma  
450 showed meaningful improvements in both adaptive and disordered eating behavior—this was  
451 especially the case for the weight-neutral program. Specifically, at the end of the intervention,  
452 women with low internalized stigma had global EDE-Q scores below (.50 *SD* units) age and  
453 gender-matched population averages reported in the literature (Mond et al., 2006) and well  
454 below (1.56 *SD* units) population averages reported for women with high BMI (>30) (Rø et al.,  
455 2012). Furthermore, women in the weight-neutral program showed significantly greater  
456 improvement in adaptive and disordered eating behaviors between baseline and post-intervention  
457 compared to women in the conventional weight-management program, independent of  
458 internalized weight stigma. In fact, women in the conventional weight-management program did  
459 not sustain positive changes in adaptive eating at the 24-month assessment, nor did they  
460 demonstrate significant within-group changes over time in global disordered eating.

461 When dimensions of disordered eating were investigated separately (i.e., EDE-Q  
462 subscales), weight and shape concerns largely mirrored the global EDE-Q findings. Significant  
463 between-group differences were evident in restraint behaviors at the 6-month and 24-month  
464 assessments. Restraint increased from baseline to post-intervention in the conventional weight-  
465 management program while no significant changes were evident for the weight-neutral program.  
466 A trend in the group by time effect also indicated more pronounced improvements in eating  
467 concerns in the weight-neutral program compared to the conventional weight-management

468 program; this effect was driven by significant between-group differences in changes from  
469 baseline to 6 months.

470         These findings are consistent with previous research that has demonstrated the  
471 effectiveness of weight-neutral programs for reducing disordered eating and improving adaptive  
472 eating among women with high BMI (e.g., Bacon et al., 2005; Carrier, Steinhardt, & Bowman,  
473 1994; Mensinger et al., 2016; Provencher et al., 2009; Watkins, Ebbeck, & Levy, 2014).  
474 Moreover, this study extends prior research by highlighting internalized weight stigma as a  
475 potential factor that may mitigate the effectiveness of weight-neutral *and* conventional weight-  
476 management programs. Indeed, research shows that those with high levels of internalized weight  
477 stigma view themselves through the fat-phobic lens that is omnipresent within Western culture  
478 (Brownell, Puhl, Schwartz, & Rudd, 2005; Crandall, 1994; Puhl & Latner, 2008; Sikorski et al.,  
479 2011), and internalized weight stigma can contribute to harsher self-judgments, more body  
480 shame, and less self-care (for a review, see Tylka et al., 2014).

481         Likewise, researchers are investigating new theoretical models for how weight stigma in  
482 Western culture has become embodied in high BMI individuals (Brewis, 2014; Puhl & Heuer,  
483 2010; Tomiyama, 2014; Tylka et al., 2014). These models posit multiple mechanisms that result  
484 in higher weight (e.g., physiological stress, psychosocial stress, social relationships,  
485 intergenerational effects), even amidst individuals' efforts to reduce their size through changes in  
486 eating patterns. It is important to note here that the widespread conflation of weight and health,  
487 as well as fusing eating with weight variables, is itself a structural form of weight stigma  
488 perpetuated in the scientific and medical literatures, which fuels the internalization of weight  
489 stigmatizing messages (Calogero, Tylka, & Mensinger, 2016). Indeed, being mindful of the  
490 tendency to conflate these variables in the scientific literature, and to avoid making weight a  
491 central variable in a study focused on changes in disordered and adaptive eating, we did not

492 report results for BMI and weight changes in this paper. As indicated earlier, these results are  
493 available upon request from the first author and will be reported in a relevant paper where we  
494 tested specific hypotheses related to BMI and weight changes (Mensing et al., 2016).

495 The importance of internalized weight stigma for health-related outcomes is further  
496 underscored by recent research demonstrating that internalized weight stigma and physical  
497 activity were the *only* significant predictors of physical health-related quality of life in a sample  
498 of adults who were classified as overweight or obese, even after controlling for age, BMI,  
499 medical conditions, and medication use (Latner, Durso, & Mond, 2013). Research on weight  
500 dissatisfaction (i.e., a subjective and affective self-evaluation based on one's ideal versus actual  
501 weight) similarly demonstrates how psychological perceptions and beliefs about one's body can  
502 have a stronger impact on indicators of health and well-being (e.g., blood pressure, onset of type  
503 2 diabetes) than actual BMI status (Blake et al., 2013; Muennig, Jia, Lee, & Lubetkin, 2008;  
504 Wirth et al., 2014; Wirth, Blake, Hebert, Sui, & Blair, 2015).

### 505 **Clinical Implications and Limitations**

506 Regardless of program type, it was clear from the findings that the eating behaviors of  
507 those with high internalized weight stigma were not improved. Although weight-neutral  
508 programs (e.g., Bacon et al., 2002; Provencher et al., 2009; Robison et al., 2007), such as Health  
509 at Every Size® and the curriculum employed in the present study (Omichinski, 2007), emphasize  
510 body and self-acceptance by challenging weight bias and discrimination, specific intervention  
511 components designed for the explicit purpose of reducing internalized weight stigma are largely  
512 missing. In light of the growing body of evidence on the ubiquitous scope of institutionalized  
513 weight stigma (Brochu & Esses, 2009; Malterud & Ulriksen, 2011; Phelan et al., 2014; Phelan et  
514 al., 2015; Pomeranz & Puhl, 2013), it is imperative that the psychological impact of the  
515 structural inequities faced by people living in larger-sized bodies is directly addressed. Thus,

516 lowering internalized weight stigma should be a critical target for all healthy living programs. As  
517 demonstrated in the present study, both programs lowered internalized weight stigma over time;  
518 however, a non-significant group by time effect ( $p = .173$ ) may have been due to a small sample  
519 size. When comparing the means between programs at the 6-month and 24-month assessments,  
520 large effect sizes were noted, suggesting that women in the weight-neutral program reported  
521 lower means in internalized weight stigma at these assessments.

522 Working to directly lower internalized weight stigma within conventional weight-  
523 management programs may prove to be more challenging because a goal of weight loss (and  
524 having to “reduce” to be viewed as “better” and “healthier” human beings) may be inherently  
525 stigmatizing. For example, Murakami and Latner (2015) recently demonstrated that weight  
526 dissatisfaction on the part of obese targets led to significantly greater stigmatizing and biased  
527 responses from participants compared to obese targets who expressed size acceptance. In  
528 contrast to conventional weight-management programs, a weight-neutral program explicitly  
529 promotes size acceptance, which would address internalized weight stigma more directly and  
530 potentially facilitate rejection of this stigma over time.

531 There are a number of practical strategies for directly targeting internalized weight stigma  
532 in weight-neutral programs, such as assigning portions of Bacon and Aphramor’s (2014) *Body*  
533 *Respect* for participants to read. We also propose borrowing elements from body image programs  
534 developed during the anti-dieting movement of the late 1980s and early 1990s (Garner & Wooly,  
535 1991; Polivy & Herman, 1992). Additionally, interventions targeting thin-ideal internalization  
536 would be suitable to adapt within weight-neutral programs to address internalized weight stigma,  
537 given that greater internalized weight stigma has been found to be associated with a stronger pro-  
538 thin bias (Carels & Musher-Eizenman, 2010). For example, mounting evidence supports a  
539 cognitive dissonance strategy as successful in helping female participants reject the thin ideal



540 and pro-weight loss attitudes, and thereby reduce their disordered eating behaviors (e.g., Stice &  
541 Presnell, 2007; Stice, Rohde, Gau, & Shaw, 2009). Cognitive dissonance strategies could also be  
542 designed to have participants advocate for higher weight individuals and verbally criticize anti-  
543 fat bias in order to reinforce new positive attitudes and behaviors around weight and shape.

544 Ultimately, a predominant underlying theme of a successful weight-neutral program  
545 should be that optimal self-care evolves out of self-compassion and self-acceptance (Breines &  
546 Chen, 2012; Daye, Webb, & Jafari, 2014; Magnus, Kowalski, & Mchugh, 2010; Schoenefeld &  
547 Webb, 2013). Interventions to increase self-compassion can reduce body shame (Albertson,  
548 Neff, & Dill-Shackleford, 2014), which is a potential barrier to more fully actualizing adaptive  
549 treatment effects, and is likely to coincide with high internalized weight stigma. Reducing body  
550 shame and dissatisfaction in Western culture will involve teaching body image flexibility and  
551 body appreciation, which involve relinquishing social norms for beauty, appreciating the body's  
552 unique qualities, and approaching body image threats (e.g., external pressures to be thin) with  
553 mindful awareness and self-compassion while pursuing meaningful and valued activities (Moore,  
554 Masuda, Hill, & Goodnight, 2014; Sandoz, Wilson, Merwin, Kellum, 2013; Tylka & Wood-  
555 Barcalow 2015; Webb, 2015; Webb, Wood-Barcalow, & Tylka, 2015).

556 Although the present study offered important findings regarding the benefits of a weight-  
557 neutral program for improving eating behavior, it is not without limitations. Having knowledge  
558 about the degree to which our participants utilized their newly formed support systems during the  
559 post-intervention phase would have been useful data for understanding the behavioral changes  
560 demonstrated. In addition, our small sample was primarily White, middle class, all female, and  
561 within a relatively narrow age range, thus limiting the generalizability of the results. Future  
562 research with larger, more diverse populations in gender, age, and race/ethnicity are needed to

563 understand how internalized weight stigma impacts eating-related outcomes in the context of  
564 weight-neutral and conventional weight-management programs for these groups.

565         One of the biggest limitations involved the high attrition rate at long-term follow-up.  
566 Although this is not atypical for studies involving weight reduction (e.g., Dalle et al, 2005;  
567 Douketis, Macie, Thabane, & Williamson, 2005; Fabricatore et al., 2009), attrition in weight-  
568 neutral programs has been shown to be better in comparison to conventional weight-management  
569 programs (Bacon et al., 2002, 2005). Given that the attrition analyses revealed little evidence to  
570 suggest characteristics that were predictive of study completion (aside from the significant  
571 association with race/ethnicity), we can only speculate about what could have been done  
572 differently to encourage better adherence at the 24-month follow-up. Perhaps incentives to return  
573 at 24 months should have been incrementally larger as opposed to equal to the 6-month  
574 incentives of \$20. Smaller groups at the start of the program, in addition to more active strategies  
575 to maintain group cohesion during post-intervention and follow-up (such as sponsoring a  
576 celebratory gathering every 3 to 6 months), may have helped with loyalty and commitment to the  
577 program and overall study. Past research has examined the dropout phenomenon among weight-  
578 loss interventions as a threat to validity through overestimates of treatment effect for weight  
579 (Kaplan & Atkins, 1987); it is possible similar threats to validity could occur with outcomes  
580 other than weight. As such, cautious interpretations of the present study's results are warranted.

581         As a result of attrition, we only had adequate power to detect a moderate effect or larger  
582 in this study. In the 6-month and 24-month assessments, power was reduced to a point that small  
583 effect sizes were not statistically significant. Larger sample sizes and reduced attrition may have  
584 revealed these small effect sizes to be significant; for example, perhaps the 3-way interaction  
585 (group × time × internalized weight stigma) for adaptive eating behaviors would move from

586 marginally significant to significant, and perhaps a group  $\times$  time effect would be noted for  
587 internalized weight stigma as the outcome.

### 588 **Conclusion**

589         There has been a recent call for more empirical research on weight-neutral programs for  
590 health promotion among those with high BMI (Penney & Kirk, 2015). The current study has  
591 responded to this call, and addresses a gap in the literature by focusing on the mechanisms that  
592 may enhance or undermine the success of weight-neutral programs. Our findings underscore the  
593 importance of developing program interventions that include a specific focus on internalized  
594 weight stigma. Such programs would directly address negative social stereotypes about higher  
595 weights, as well as the body shame that often accompanies inhabiting a larger body in a culture  
596 where these bodies are stigmatized. In summary, with weight stigma gaining increased attention  
597 in the public health discourse (Puhl & Latner, 2008; Puhl & Peterson, 2014; Ramos, 2015), the  
598 literature has made it clear that the next generation of research on weight-neutral programs  
599 would benefit from considering both experienced and internalized weight stigma as primary  
600 variables of interest in the development of interventions for improving health and well-being.

601

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608

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930

Footnote

931

<sup>1</sup>Program differences in changes in BMI for individuals as a function of internalized

932

weight stigma are available upon request by contacting the first author at

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934

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935 Figure Captions

936 *Figure 1.* Flowchart of participant involvement. \* No significant differences were observed  
937 between programs on completion rates ( $p = .37$ ).

938  
939 *Figure 2.* Internalized weight stigma as a moderator of adaptive eating in a weight-neutral versus  
940 conventional weight-management program. IWS = Internalized Weight Stigma. WN = Weight-  
941 Neutral Program. CWM = Conventional Weight-Management Program.

942  
943 *Figure 3.* Internalized weight stigma as a moderator of disordered eating in a weight-neutral  
944 program versus a conventional weight-management program. EDE-Q = Eating Disorder  
945 Examination Questionnaire. IWS = Internalized Weight Stigma. WN = Weight-Neutral Program.  
946 CWM = Conventional Weight-Management Program.

947  
948 *Figure 4.* Changes in internalized weight stigma after participating in a weight-neutral program  
949 versus a conventional weight-management program. WBIS = Weight Bias Internalization Scale.  
950 WN = Weight-Neutral Program. CWM = Conventional Weight-Management Program.

**Table 1.** Baseline Characteristics of the Study Sample

Characteristic	Weight-Neutral Program	Conventional Weight-Management Program	<i>p</i> -value <sup>†</sup>
	<i>n</i> (%) <sup>§</sup>	<i>n</i> (%) <sup>§</sup>	
<b>Education</b>			.066
High School Diploma, or Some High School	8 (20)	14 (35)	
Some College (or Technical School)	17 (43)	21 (53)	
College Graduate (Bachelor's Degree)	10 (25)	4 (10)	
Graduate or Professional Degree	5 (13)	1 (3)	
<b>Employment Status, <i>n</i> (%)</b>			.378
Employed for Wages Full-Time	22 (55)	31 (78)	
Employed for Wages Part-Time	11 (28)	6 (15)	
Not Working	7 (18)	3 (8)	
<b>Race/Ethnicity</b>			.644
African American/Black Non-Hispanic	0 (0)	1 (3)	
Hispanic	3 (8)	1 (3)	
White Non-Hispanic	37 (93)	38 (95)	
<b>Relationship Status</b>			.962
Married	28 (70)	28 (70)	
Member of an Unmarried Couple	4 (10)	4 (10)	
Divorced	2 (5)	3 (7)	
Never Been Married	6 (15)	5 (12)	
<b>Mean Age (<i>SD</i>), <i>y</i></b>	39.83 (4.34)	39.35 (3.91)	.609
<b>Mean Body Mass Index (<i>SD</i>), kg/m<sup>2</sup></b>	37.42 (0.57)	38.56 (0.65)	.191
<b>Median Household Income (min-max), US\$<sup>†</sup></b>	68,750 (18,000-180,000)	60,000 (12,000-130,000)	.504
<b>Median Individual Income (min-max), US\$<sup>*</sup></b>	29,500 (0-120,000)	30,000 (5,000-75,000)	.916

<sup>§</sup> Percentages are rounded to the higher integer when value => .5 causing totals to exceed 100%

<sup>†</sup> *p*-values based on *t*-tests, chi-squares, and Mann-Whitney U-tests as appropriate for variable types

<sup>‡</sup> Household income data missing for 2 Weight-Neutral Program participants

<sup>\*</sup> Individual income data missing for 1 Conventional Weight-Management program participant

**Table 2.** Estimated Marginal Means for Eating Behaviors and Internalized Weight Stigma (IWS) by Group over Time

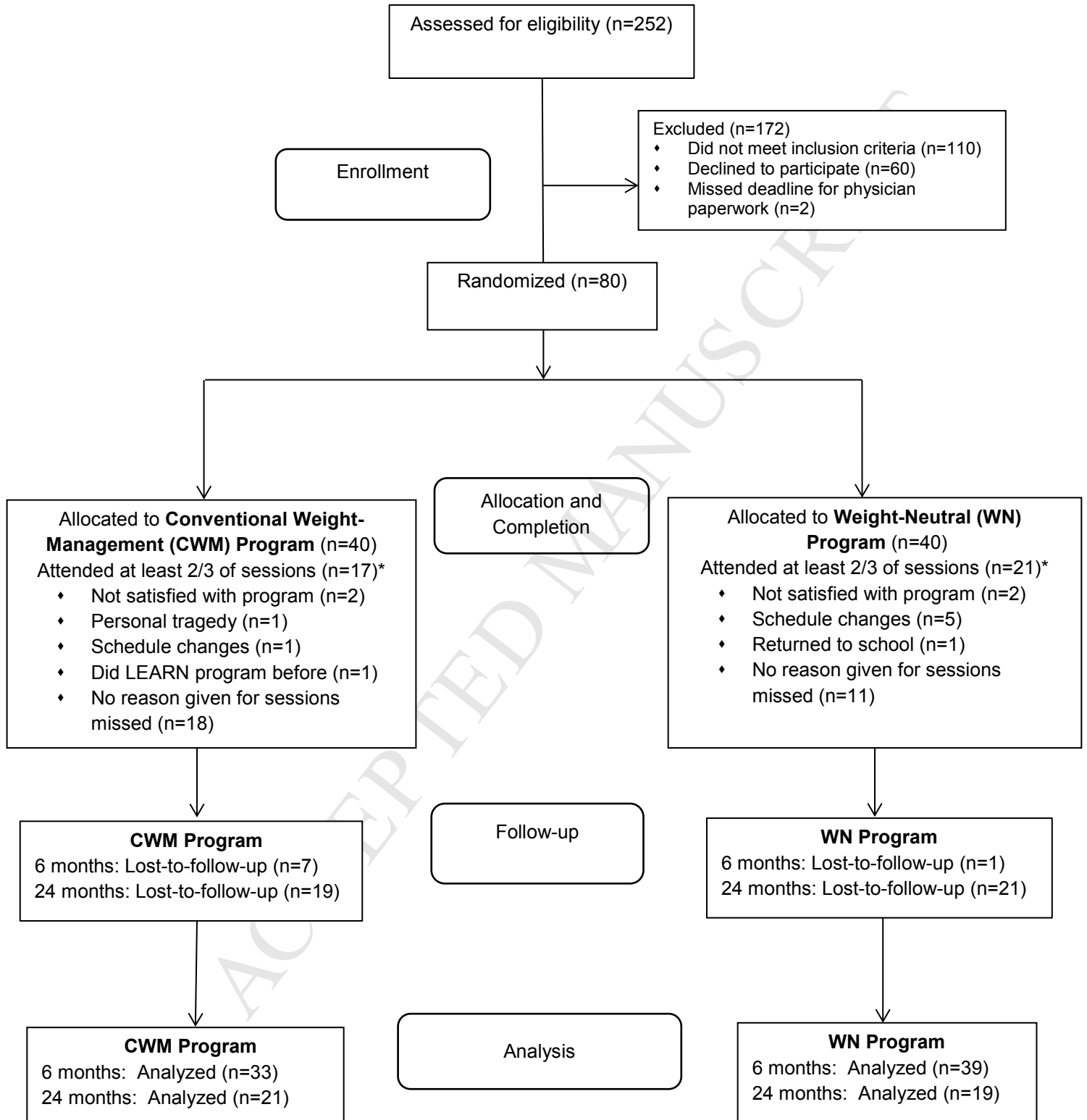
	Weight-Neutral Program	Conventional Weight-Management Program	Between-Group Differences <sup>†</sup> (95% CI)	IWS x Group x Time F (df)	IWS x Time F (df)	Group x Time F (df)	IWS Main Effect F (df)
<b>Adaptive Eating (IES)</b>							
Baseline	40 2.87 (0.07)	40 2.93 (0.06)					
6 months	37 3.29 (0.06)*	33 3.11 (0.06)*	-0.23 (-0.41 to -0.06)	2.26 (2, 115)	4.74 (2, 115)	3.43 (2, 106)	29.27 (1, 162)
24 months	19 3.15 (0.08)*	21 3.05 (0.07)	-0.15 (-0.37 to 0.07)	<i>p</i> = .109	<i>p</i> = .011	<i>p</i> = .036	<i>p</i> < .001
Within-group effects, <i>F</i> (df)	22.69 (2, 107) <i>p</i> < .001	3.71 (2, 106) <i>p</i> = .028					
<b>Global Disordered Eating (EDE-Q)</b>							
Baseline	40 2.58 (0.11)	40 2.35 (0.11)					
6 months	37 1.75 (0.11)*	33 2.19 (0.11)	0.66 (0.27 to 1.05)	4.20 (2, 130)	8.93 (2, 130)	5.67 (2, 115)	70.36 (1, 139)
24 months	19 2.00 (0.15)*	21 2.10 (0.14)	0.32 (-0.16 to 0.77)	<i>p</i> = .017	<i>p</i> < .001	<i>p</i> = .004	<i>p</i> < .001
Within-group effects, <i>F</i> (df)	19.29 (2, 116) <i>p</i> < .001	1.22 (2, 114) <i>p</i> = .229					
<b>EDE-Q Weight Concern</b>							
Baseline	40 3.35 (0.13)	40 3.24 (0.13)					
6 months	37 2.35 (0.12)*	33 2.52 (0.13)*	0.24 (-0.21 to 0.70)	6.14 (2, 134)	9.45 (2, 134)	0.73 (2, 117)	90.99 (1, 130)
24 months	19 2.18 (0.17)*	21 2.38 (0.16)*	0.27 (-0.28 to 0.81)	<i>p</i> = .003	<i>p</i> < .001	<i>p</i> = .490	<i>p</i> < .001
Within-group effects, <i>F</i> (df)	26.22 (2, 118) <i>p</i> < .001	13.70 (2, 116) <i>p</i> < .001					
<b>EDE-Q Shape Concern</b>							
Baseline	40 4.29 (0.16)	40 4.13 (0.16)					
6 months	37 2.88 (0.15)*	33 3.15 (0.16)*	0.42 (-0.13 to 0.96)	2.91 (2, 125)	13.13 (2, 124)	1.50 (2, 110)	90.89 (1, 140)
24 months	19 2.97 (0.21)*	21 3.29 (0.20)*	0.46 (-0.19 to 1.11)	<i>p</i> = .058	<i>p</i> < .001	<i>p</i> = .229	<i>p</i> < .001
Within-group effects, <i>F</i> (df)	31.88 (2, 110) <i>p</i> < .001	13.65 (2, 109) <i>p</i> < .001					
<b>EDE-Q Eating Concern</b>							
Baseline	40 1.53 (0.15)	40 1.13 (0.15)					
6 months	37 0.83 (0.14)*	33 0.88 (0.19)	0.46 (0.01 to 0.91)	0.76 (2, 115)	2.84 (2, 115)	2.20 (2, 105)	15.43 (1, 160)
24 months	19 0.60 (0.19)*	21 0.57 (0.19)*	0.37 (-0.17 to 0.92)	<i>p</i> = .469	<i>p</i> = .063	<i>p</i> = .119	<i>p</i> < .001
Within-group effects, <i>F</i> (df)	15.10 (2, 106) <i>p</i> < .001	4.19 (2, 105) <i>p</i> < .018					
<b>EDE-Q Restraint</b>							
Baseline	40 1.15 (0.18)	40 0.89 (0.18)					
6 months	37 0.91 (0.17)	33 2.22 (0.18)*	1.54 (0.89 to 2.20)	1.40 (2, 136)	1.13 (1, 130)	11.11 (2, 120)	0.39 (1, 130)
24 months	19 1.40 (0.25)	21 2.16 (0.23)*	1.02 (0.23 to 1.81)	<i>p</i> = .250	<i>p</i> = .325	<i>p</i> < .001	<i>p</i> = .531
Within-group effects, <i>F</i> (df)	1.58 (2, 121) <i>p</i> = .211	18.38 (2, 118) <i>p</i> < .001					
<b>Internalized Weight Stigma (WBIS)</b>							
Baseline	40 4.32 (0.19)	40 4.28 (0.19)					
6 months	37 3.25 (0.18)*	33 3.57 (0.19)*	0.36 (-0.11 to 0.82)			1.79 (2, 104)	

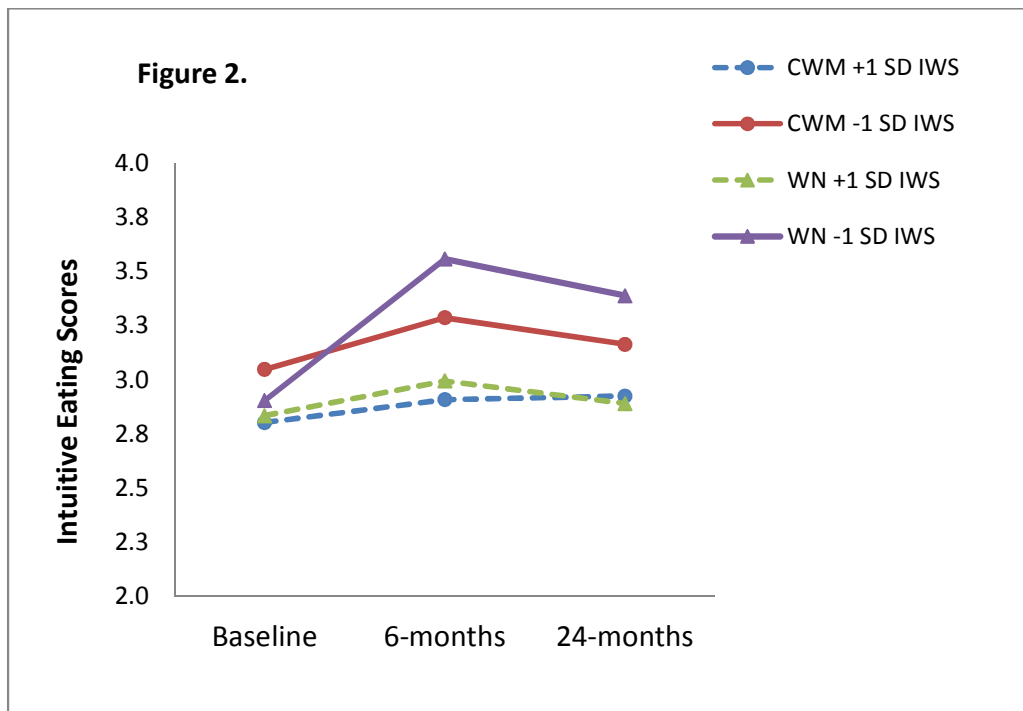
24 months	19	3.31 (0.22)*	21	3.75 (0.22)*	0.48 (-0.09 to 1.05)	NA	NA	$p = .173$	NA
Within-group effects, $F(df)$	24.73 (2, 103)	$p < .001$	8.86 (2, 105)	$p < .001$					

<sup>†</sup> Mean differences in change from baseline at 6 months and 24 months after controlling for IWS (except where IWS is the outcome), group, time, and all 2-way and 3-way interactions in the linear mixed model

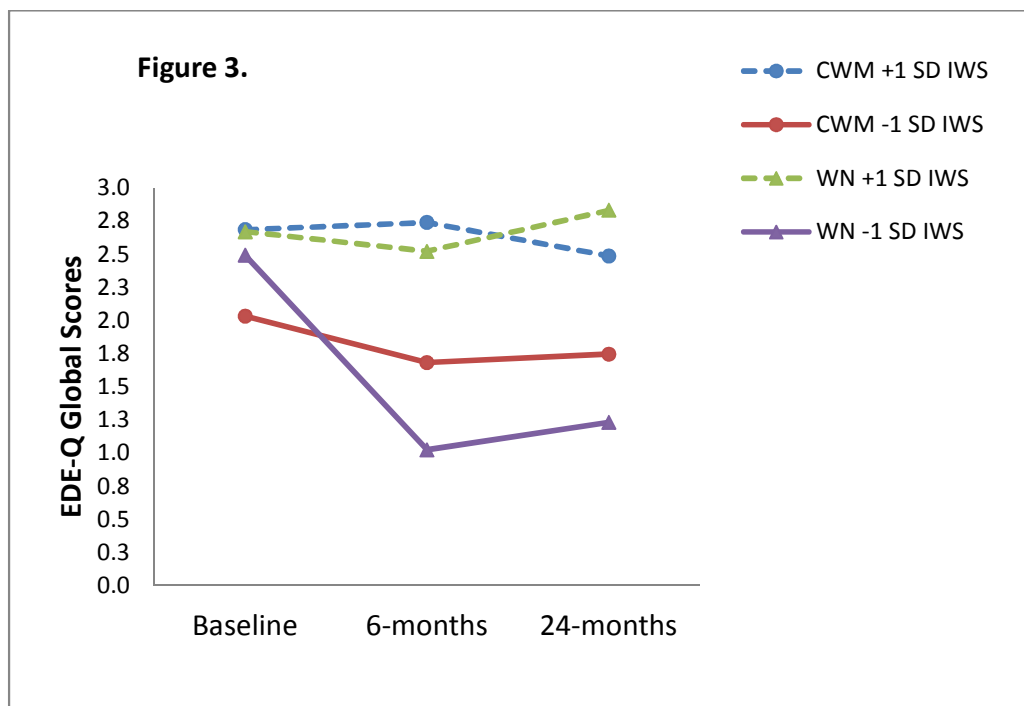
\* Significant within-group difference from baseline ( $p < .05$ )

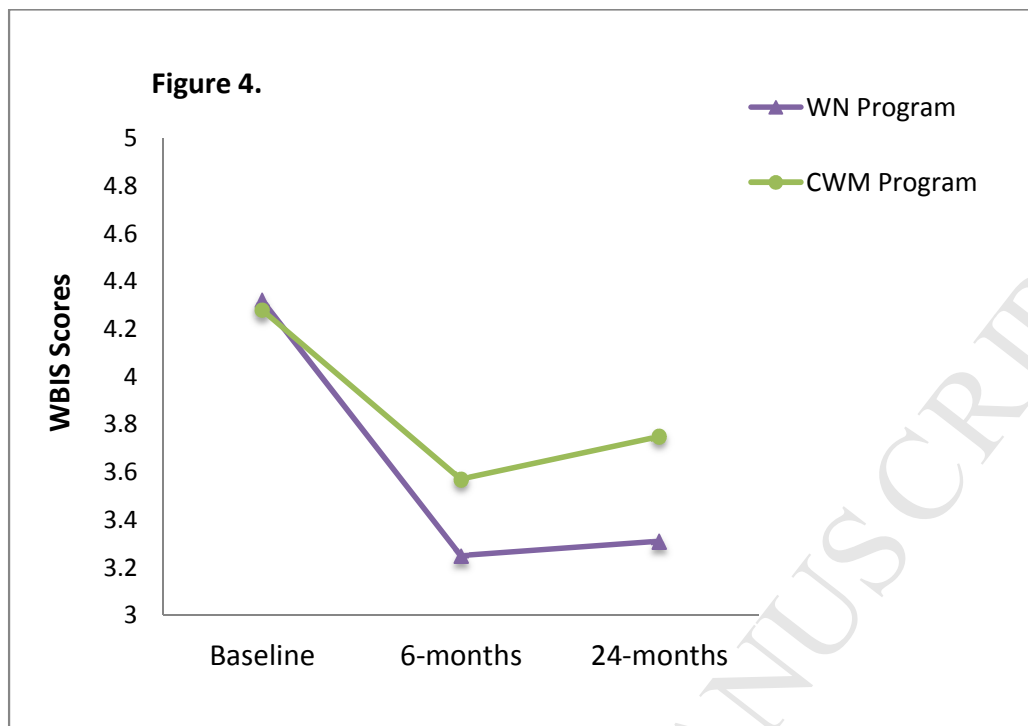
Figure 1.











## Highlights

- Women with high BMI participated in a weight-neutral or conventional weight-management program.
- Impact of internalized weight stigma (IWS) on women's eating behaviors was explored.
- Women in the weight-neutral program with low IWS improved disordered and adaptive eating.
- Women with high IWS did not improve disordered or adaptive eating in either program.