WILEY

International Journal of
EATING DISORDERS

ORIGINAL ARTICLE

Internet-delivered eating disorder prevention: A randomized controlled trial of dissonance-based and cognitive-behavioral interventions

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Abstract

Objective: The current study evaluated two web-based programs for eating disorder prevention in high-risk, predominantly ethnic minority women.

Method: Two hundred and seventy-one women with elevated weight concerns were randomized to Internet dissonance-based intervention (DBI-I), Internet cognitive-behavioral intervention (CBI-I), or no intervention (NI). Both interventions consisted of four weekly online sessions. Participants were assessed at pre- and post intervention. Outcome measures included eating pathology, body dissatisfaction, dieting, thin-ideal internalization, and depression.

Results: At postintervention, DBI-I and CBI-I led to greater reductions in body dissatisfaction, thin-ideal internalization, and depression than NI. In addition, CBI-I was effective at reducing dieting and composite eating pathology relative to NI. No outcome differences were found between the active conditions. Moderation analyses suggested that both active conditions were more effective for ethnic minorities than Whites relative to NI.

Discussion: Results suggest that both DBI-I and CBI-I are effective at reducing eating disorder risk factors in a high-risk, predominantly minority population relative to no intervention.

KEYWORDS
cognitive-behavioral, dissonance-based intervention, eating disorder prevention, Internet, randomized controlled trial

1 | INTRODUCTION

Eating disorders (EDs) are among the most severe and debilitating mental health syndromes. Because of factors such as pronounced physiological damage and increased risk for suicidality, EDs are associated with increased mortality risk (Smink, Hoeken, & Hoek, 2012). Moreover, individuals with EDs are at elevated risk for the development of other psychiatric problems, such as depression (Hudson, Hiripi, Pope, & Kessler, 2007; Johnson, Cohen, Kasen, & Brook, 2002). Given the substantial social, psychological, and economic costs attributed to EDs, various behavioral interventions have been implemented with individuals at risk (Loucas et al., 2014). Two approaches frequently utilized for reducing ED risk are dissonance-based intervention (DBI) and cognitive-behavioral treatment (CBT).

DBI encourages participants to actively argue against the media-propagated thin-ideal body type (Stice, 2002; Stice, Mazotti, Weibel, & Agras, 2000). DBIs are informed by cognitive-dissonance theory, which posits that discrepancy between beliefs and behaviors fosters psychological discomfort (Festinger, 1962). When participants with body image concerns engage in activities that argue against the thin-ideal, their beliefs and attitudes should shift towards a less negative body image to reduce cognitive dissonance. This shift in beliefs and attitudes is associated with reduced body dissatisfaction and less restrictive eating (Stice, Rohde, Gau, & Shaw, 2009). DBI is effective at reducing ED symptoms in high-risk populations when compared to no treatment or placebo, and may also be superior to alternative treatment (Stice, Shaw, Becker, & Rohde, 2008).

CBT for ED is based on the premise that psychological risk factors (e.g., fear of fatness, weight concern) increase vulnerability to negative

self-schemas involving body image and eating (Williamson, White, York-Crowe, & Stewart, 2004). Maladaptive eating behaviors are utilized by individuals with ED to reduce the negative affect associated with unpleasant cognitions, sustaining a cycle of maladaptive thoughts, emotions, and eating habits (Williamson et al., 2004). Accordingly, CBT focuses on the modification of negative cognitions related to body shape and weight (Wilson, Fairburn, Agras, Walsh, & Kraemer, 2002). Meta-analytic research has reported positive treatment outcomes for CBT ED prevention programs (Beintner, Jacobi, & Taylor, 2012).

Despite the noted severity of eating problems, few individuals with ED symptoms seek treatment for disturbed eating patterns (Cachelin, Rebeck, Veisel, & Striegel-Moore, 2001; Cachelin & Striegel-Moore, 2006). Individuals with EDs report considerable shame and guilt, contributing to a low likelihood of treatment-seeking (Cachelin et al., 2001). Furthermore, people with ED exhibit limited insight regarding the severity of their symptoms. In a study by Cachelin et al. (2001), only 5.7% of individuals diagnosed in a structured clinical interview reported that they believed they had an ED. Among those who do seek treatment, <20% are expected to pursue the counsel of a mental health professional, with the majority of individuals seeking advice from sources lacking ED expertise (Cachelin et al., 2001). Given these challenges to the provision of face-to-face ED intervention, Internet interventions are well suited to increase the likelihood of ED treatment-seeking because of enhanced privacy and convenience of access.

In addition to reducing barriers to therapy access, Internet-based intervention offers technology-driven advantages for the implementation of ED prevention. For example, intervention components can be automated to ensure that participants receive a similar dosage of active treatment ingredients (e.g., automatic release of therapy modules, pre-scheduled between-session emails). Computerized programs are easier to standardize than face-to-face interventions, increasing the likelihood that each participant will receive an equivalent version of the intervention (Bauer & Moessner, 2013). Meta-analytic work suggests that Internet-supported treatments are comparable in efficacy to face-to-face treatments (Barak, Hen, Boniel-Nissim, & Shapira, 2008), providing further support for the utilization of electronic intervention strategies. Past research has found positive intervention effects for Internet-delivered DBI (Stice, Durant, Rohde, & Shaw, 2014) and CBT (Beintner et al., 2012).

While consistent support exists for both interventions, several notable gaps exist in the literature. Because of the widespread use of the treatment versus control study design in the ED literature, little is known about the relative efficacy of different ED interventions. As DBI and CBT are the most well-validated ED prevention approaches to date, it is crucial to elucidate potential differences in outcomes between the two treatments as a step toward identifying which populations might benefit from these interventions. To this end, the implementation of studies featuring active interventions that are matched in structure and duration is advantageous for assessing comparative efficacy. To our knowledge, this methodology has not been utilized in the ED prevention literature.

Furthermore, the external validity of earlier findings is questionable because ethnic minorities are mostly missing from ED prevention (Chithambo & Huey, 2017; Fingeret, Warren, Cepeda-Benito, & Gleaves, 2006; Taylor et al., 2016). However, research has identified discrepancies in body image ideals between ethnic groups (Yates, Edman, & Aruguete, 2004). For example, Black and Latino women tend to prefer a heavier female body weight than Whites on average (Grabe & Hyde, 2006; Roberts, Cash, Feingold, & Johnson, 2006), while Asian women prefer a lighter body weight (Kennedy, Templeton, Gandhi, & Gorzalka, 2004; Soh et al., 2008). Thus, interventions that are efficacious for predominantly White populations may be less effective for ethnic minorities because they focus on a Eurocentric body ideal. On the other hand, some research reports comparable ED prevention outcomes for Whites and minorities. For instance, Rodriguez, Marchand, Ng, and Stice (2008) found that DBI is equally effective for Whites, Asians, and Latinos. More research is needed to clarify whether findings indicating positive ED prevention effects can be generalized to members of diverse populations.

1.1 | Current study

The current study compared the efficacy of Internet-based DBI (DBI-I) and Internet-based cognitive-behavioral intervention (CBI-I) in a sample of at-risk, predominantly minority women. We hypothesized that both CBI-I and DBI-I would reduce ED risk when compared to NI. Since meta-analytic research has identified DBI as the most efficacious strategy when compared to other interventions for reducing ED risk (Stice, 2002; Stice et al., 2008), we expected that DBI-I would yield larger outcomes when compared to NI than CBI-I versus NI. Given limited power to detect differences between CBI-I and DBI-I based on our anticipated sample size, analyses comparing the two active conditions were exploratory in nature. As little research is available on ethnic differences in ED intervention response, exploratory moderation analyses were conducted to examine ethnicity (White vs. minority) as a moderator of treatment outcomes.

2 | METHOD

2.1 | Participants

Participants were students at a large, private university in southern California. Demographic and clinical characteristics are summarized in Table 1. The mean age for the sample was 20.85 years ($SD = 3.15$). Forty-one percent of participants were Asian, 33% White, 12% Latino, 6% Black, 7% multi-ethnic, and 2% "other". The average body mass index (BMI) was 22.04 (normal weight; $SD = 3.69$). Because eating pathology is rare among males (Hudson et al., 2007), and because intervention content focused on female body weight and shape, only women were included.

The weight concerns scale (WCS) was used to screen for ED risk (Killen et al., 1996). To obtain a high-risk, subclinical sample of participants, individuals with a score of 34 (the mean score for a community sample of adolescent females; Killen et al., 1996) or higher were eligible

TABLE 1 Baseline demographic characteristics and outcome variables

	Total (n = 271)	DBI-I (n = 90)	CBI-I (n = 88)	NI (n = 93)	F	χ^2	p
Age (years), M (SD)	20.85 (3.15)	20.63 (3.62)	21.32 (3.82)	20.60 (1.55)	.89	—	.37
BMI, M (SD)	22.04 (3.69)	22.21 (3.69)	22.29 (3.27)	21.64 (4.07)	1.03	—	.32
Ethnicity						1.01	.91
Asian, n (%)	110 (40.6)	39 (43.3)	34 (38.6)	37 (39.8)	—		
White, n (%)	89 (32.8)	26 (28.9)	31 (35.2)	32 (34.4)	—		
Latino, n (%)	32 (11.8)	11 (12.2)	13 (14.8)	8 (8.6)	—		
Black, n (%)	16 (5.9)	7 (7.8)	5 (5.7)	4 (4.3)	—		
Multi-ethnic, n (%)	20 (7.4)	5 (5.6)	5 (5.7)	10 (10.8)	—		
Other, n (%)	4 (1.5)	2 (2.2)	0 (0.0)	2 (2.2)	—		
T1 outcome variables							
Body dissatisfaction, M (SD)	100.62 (28.61)	97.26 (26.27)	99.42 (32.13)		.30		.74
Thin-ideal internalization, M (SD)	24.11 (2.94)	23.18 (3.27)	23.56 (3.02)		2.06		.13
Eating pathology, M (SD)	9.03 (6.55)	9.62 (7.47)	10.43 (8.09)		.82		.44
Dieting, M (SD)	29.02 (5.95)	29.91 (7.49)	28.58 (7.28)		.85		.85
Depression, M (SD)	31.86 (8.48)	29.05 (7.47)	30.29 (7.58)		2.88		.06

Note. BMI = body mass index; CBI-I = Internet cognitive-behavioral treatment; DBI-I = Internet dissonance-based intervention; NI = no intervention.

for inclusion in the study. The WCS has adequate predictive validity for ED onset (Killen et al., 1996), and has been utilized as a screening measure in previous ED prevention programs (Ljotsson et al., 2007; Manwaring et al., 2008; Taylor et al., 2006). Individuals with a score of 20 or higher on the Eating Attitudes Test (EAT) (Garner, Olmstead, & Polivy, 1983) were excluded from the study because the interventions were designed for use with a subclinical population.

Participants who endorsed a 2 ("I would like to kill myself") or 3 ("I would kill myself if I had the chance") on the Beck Depression Inventory's *suicidal thoughts* item were ineligible as well (Beck, Steer, & Brown, 1996). In addition to providing referral information for local treatment providers, we called participants who expressed suicidal ideation (n = 1) in order to assess risk and assure safety.

2.2 | Design

The study adopted a 3 (Intervention condition: DBI-I, CBI-I, NI) X 2 (Time: pre-intervention, postintervention) design, with participants randomized to DBI-I, CBI-I, or NI. In total, 271 individuals were recruited, exceeding the number required to detect a moderate effect size at the $p < .05$ level (N = 179; Faul, Erdfelder, Lang, & Buchner, 2007). This effect size was chosen based on findings from previous Internet ED prevention programs (Beintner et al., 2012; Stice, Rohde, Durant, & Shaw, 2012). For all conditions, outcome measures were collected on two occasions. Time 1 data collection took place immediately prior to the first intervention session (Baseline; T1). The assessment questionnaires and intervention content were delivered via the online survey platform Qualtrics. Participants were randomized at the conclusion of the T1 assessment using an automated randomization feature within the survey software. Time 2 data collection occurred four weeks later, following the fourth and final intervention session (Post-treatment; T2). Participants in the control condition were assessed on the same schedule, with T2 scheduled four weeks after T1. See Figure 1 for a CONSORT diagram of participant flow through the study.

2.3 | Procedures

2.3.1 | Screening and recruitment

Participants were recruited from a university-based psychology subject pool. Individuals who signed up for the study were emailed an Internet link to a brief survey that included screening items to assess ED pathology and suicidal ideation.

Eligible participants were emailed instructions for initiating their assigned program, as well as a link to the study website. The link directed participants to an information sheet for consent and baseline assessment measures. A copy of the information sheet was also provided via email. At the conclusion of the baseline assessment, a link to the first treatment session was emailed to participants assigned to an active study condition. For the subsequent three sessions, an email containing an access link was sent on a weekly basis. Though sessions were emailed sequentially, once emailed participants had access to each session throughout the duration of the study. Excluding the assessment battery, the sessions and corresponding homework assignments were designed to require approximately 1 hour a week of participation. The authors reviewed homework content each week. Those in the active intervention conditions received five research credits (5 credits for each assessment and 1 credit for each session), while NI participants received one credit. For all participants, credits were administered upon completion of the T2 assessment. Study procedures were approved by the university institutional review board.

2.4 | Intervention conditions

2.4.1 | Internet dissonance-based intervention

The DBI-I program consisted of four Internet-delivered sessions that took place over the course of 28 days at a frequency of one session per week. A homework assignment was given each week, and was due one week after the preceding session. Each DBI-I session consisted of activities that encouraged participants to write arguments against the
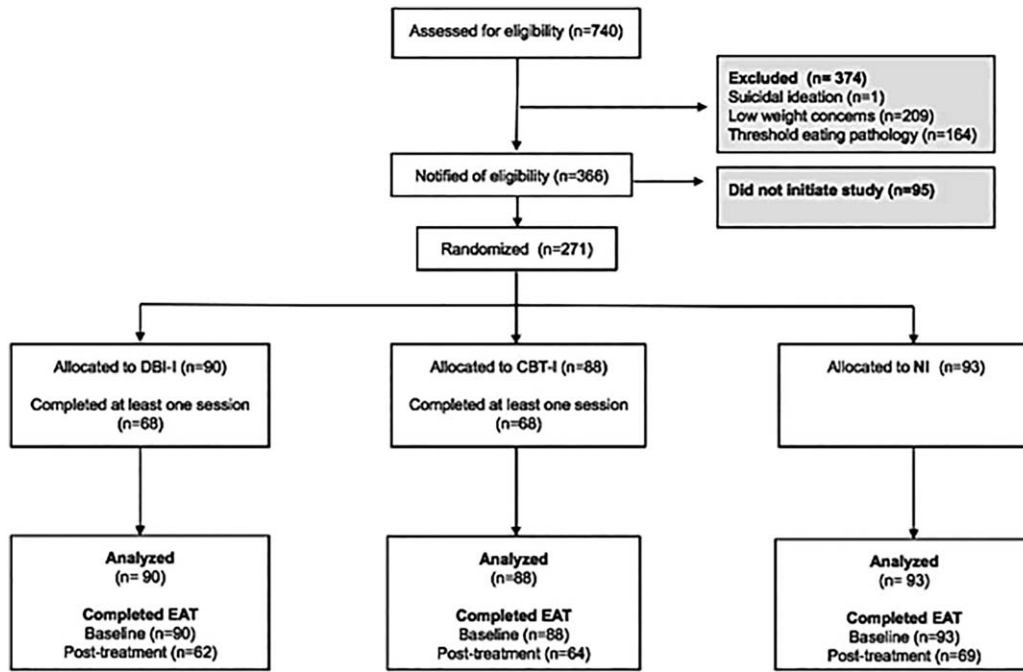
FIGURE 1 Participant flow chart. CBI-I = Internet cognitive-behavioral treatment; DBI-I = Internet dissonance-based intervention; EAT = Eating Attitudes Test; NI = no intervention

thin-ideal. Content was derived primarily from the facilitator manual for the latest version of the *Body Project*, an established DBI-I protocol for ED prevention (Stice & Presnell, 2007).

During the first session, participants typed written responses to prompts that provided education about the media-propagated thin-ideal, and generated arguments against the thin ideal. For homework, participants were assigned to write a letter to an adolescent girl detailing the costs of the thin-ideal. For session 2, participants typed verbal challenges to statements that endorsed a drive towards thinness (e.g., "I am too chubby to eat dessert after dinner today"). For the second homework assignment, participants were assigned to come up with examples of thin-ideal situations in their own lives, and write examples of how they would respond now given their knowledge about the thin ideal. In session 3, participants typed examples of comebacks to verbal statements that endorse the thin ideal. Participants were asked to generate 10 ways they could publicly challenge the thin ideal as homework. During session 4, participants read information on identifying

instances of thin-ideal talk in their own lives. They also typed verbal challenges to statements indicative of thin-ideal talk. For homework, participants were assigned to write a second letter to an adolescent girl, taking into account the information they had learned throughout the program.

2.4.2 | Internet-based cognitive-behavioral intervention

CBI-I sessions were also provided via the Internet. The sessions were designed to be parallel in structure and appearance to DBI-I, but were based on an alternative theoretical model positing that negative body image thoughts and assumptions sustain disturbed body evaluation and maladaptive eating behaviors. Consequently, participants in this condition were instructed to challenge appearance assumptions, as well as identify and restructure thoughts associated with poor body image. CBI-I content was derived primarily from sections of *The Body Image Workbook*, a self-help manual for body dissatisfaction (Cash, 1997).
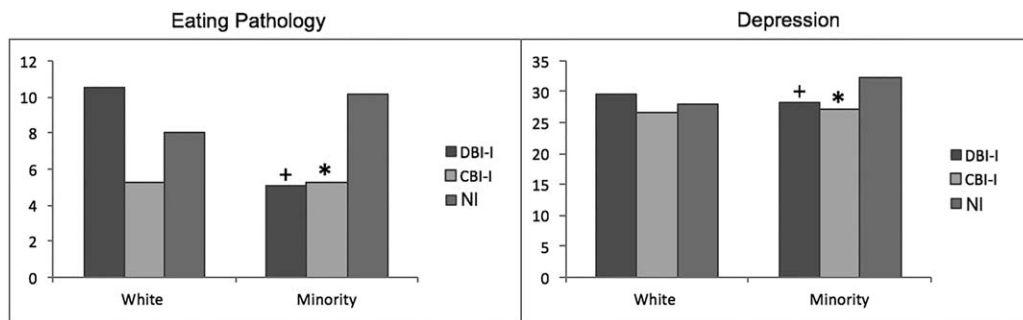

FIGURE 2 Ethnicity moderation results. T2 scores are depicted for each outcome. CBI-I = cognitive-behavioral treatment; DBI-I = Internet dissonance-based intervention; NI = no intervention. [+]Significant DBI-I versus NI difference. *Significant CBI-I versus NI difference.

During the first session, participants typed answers to questions that assessed their knowledge of the symptoms and prevalence of poor body image. They were also encouraged to reflect on the association between critical body image thoughts and low mood. For homework, they were assigned to write a one-page summary of what they had learned in the session. In session 2, participants identified alternative interpretations of cognitive distortions that sustain poor body image. For homework, they were assigned to generate examples of "appearance assumptions" relevant to their own lives and identify alternative interpretations. During session 3, participants provided rational responses to hypothetical negative body cognitions (e.g., "I am less attractive than everyone else"). As homework, participants were assigned to generate a list of 10 benefits they might derive from changing their body image thoughts. For session 4, participants typed responses challenging hypothetical insensitive body remarks made by others. The participants were asked to write a one-page letter summarizing what they had learned during the course of the intervention as a final homework assignment.

2.4.3 | NI

NI participants were not offered any intervention activities; rather, their participation consisted solely of completing the T1 and T2 assessment measures.

2.5 | Measures

2.5.1 | Demographics

A demographics questionnaire developed for the study was used to obtain information regarding participant age, gender, body mass, and self-identified racial/ethnic background.

2.5.2 | Body dissatisfaction

The 34-item Body Shape Questionnaire (BSQ) assessed weight and shape concerns (Cooper, Taylor, Cooper, & Fairburn, 1987). Validation studies report adequate test-retest reliability ($r = .88$), as well as concurrent validity with alternate measures of body image concern (Rosen, Jones, Ramirez, & Waxman, 1996). Coefficient α at baseline for the current study was .96.

2.5.3 | Thin-ideal internalization

The revised Ideal Body Stereotype Scale (IBSS) measured idealization of a slim female physique (Stice, Ziemba, Margolis, & Flick, 1996). The IBSS demonstrates adequate internal reliability ($\alpha = .91$), 2-week test-retest reliability ($r = .80$), and predictive validity for bulimia symptom onset (Stice et al., 1996). For the current study, an α of .73 was obtained.

2.5.4 | Composite eating pathology

The EAT was used to measure eating and body image pathology. The dieting, bulimia, and restrictive eating subscales of the EAT correlate with bulimia and body image dissatisfaction symptoms in prior studies (Garner et al., 1983). The reliability coefficient was .81.

2.5.5 | Dieting

The Dutch Restrained Eating Scale (DRES) assessed dieting behaviors. The DRES demonstrates high internal consistency ($\alpha = .95$), as well as predictive validity for bulimia symptom onset (Stice, Cooper, Schoeller, Tappe, & Lowe, 2007). Coefficient α was .88.

2.5.6 | Depressive symptoms

The 21-item Beck Depression Inventory-II (BDI-II) was used as a measure of depressive symptoms over the past week (Beck et al., 1996). The BDI-II exhibits adequate internal consistency ($\alpha = .84$; Yin & Fan, 2000), as well as concurrent validity with alternate self-report measures of depression (Storch, Roberti, & Roth, 2004). Coefficient α for the study sample was .90.

2.6 | Analyses

2.6.1 | Baseline characteristics

χ^2 and one-way ANOVA analyses were conducted to test group differences in baseline demographic and outcome variables.

2.6.2 | Main outcomes

To evaluate the effect of intervention condition on primary study outcomes, we regressed each dependent variable on two dummy-coded vectors representing intervention condition, with baseline scores for each respective outcome included as covariates in the model. Wald χ^2 tests of the joint significance of coefficients were conducted to determine whether the omnibus condition effect was significant (Tu & Zhou, 1999). T-tests with Bonferroni-adjusted p values were utilized to examine between-group differences in outcomes. In addition, effect sizes for main outcomes (Cohen's d) were calculated, using adjusted post-treatment means for the numerator and the pooled post-treatment standard deviation as denominator (Cohen, 1988).

2.6.3 | Moderation analyses

To test the moderation hypotheses, regression models consisting of the two condition dummy codes, a dummy-coded ethnicity variable (0 = White, 1 = Minority), and two dummy-coded variables representing the condition × ethnicity interaction terms were fit for each outcome. Baseline outcome scores were included as covariates. The statistical significance of each interaction term was examined to determine whether moderation occurred. When significant interaction effects were detected, post hoc tests with Bonferroni-adjusted p values were run to identify simple effects between groups.

2.6.4 | Missing data

Full information maximum likelihood estimation was used to handle missing data; the algorithm generates parameter estimates by using data from all observations, rather than deleting cases with missing observations listwise (Enders & Bandalos, 2001). In order to adhere to the maximum likelihood estimation assumption that data are missing at random, a dummy variable denoting missingness from the T2 assessment (0 = no dropout, 1 = dropout) was included in all regression models as a covariate. Because all subject-level predictors of dropout may

TABLE 2 Raw means and standard deviations of primary outcome variables at each time point

	Baseline			Post-treatment		
Outcome	DBI-I (n = 90)	CBI-I (n = 88)	NI (n = 93)	DBI-I (n = 62)	CBI-I (n = 64)	NI (n = 69)
Body dissatisfaction, M (SD)	100.62 (28.61)	97.26 (26.27)	99.42 (32.13)	86.69 (32.51)	77.79 (28.42)	92.91 (29.44)
Thin-ideal internalization, M (SD)	24.11 (2.94)	23.18 (3.27)	23.56 (3.02)	21.03 (5.06)	21.25 (3.83)	23.30 (3.10)
Eating pathology, M (SD)	9.03 (6.55)	9.62 (7.47)	10.43 (8.09)	6.85 (7.88)	5.27 (5.66)	9.38 (10.51)
Dieting, M (SD)	29.02 (5.95)	29.91 (7.49)	28.58 (7.28)	26.23 (7.43)	25.86 (8.16)	27.75 (7.20)
Depression, M (SD)	31.86 (8.48)	29.05 (7.47)	30.29 (7.58)	28.63 (6.82)	26.94 (8.17)	30.81 (8.33)

Note. DBI-I = Internet dissonance-based intervention; CBI-I = Internet cognitive-behavioral treatment; NI = No intervention. Post-treatment means and standard deviations are reported for completers of each assessment period.

not be known, this is a more flexible approach to obtain unbiased parameter estimates than the use of selection models that include predictors of dropout (e.g., demographic characteristics, pre treatment pathology) as covariates (Hedeker & Gibbons, 1997). Results did not differ between models that included the dropout covariate and those that did not. Therefore, outcomes for the baseline model without missingness covariates are reported.

3 | RESULTS

3.1 | Baseline characteristics

A series of one-way ANOVA and χ^2 analyses were performed to evaluate group differences in baseline pathology and demographic characteristics. No significant differences were found (Table 2; p values range = .06 to .91).

3.2 | Attrition

Seventy-two percent of participants (n = 195) completed the postintervention assessment. Dropout rates for DBI-I, CBI-I, and NI were 31.1% (n = 28), 27.3% (n = 24), and 25.8% (n = 24), respectively. No differences in dropout frequency were found between the three conditions.[1]

3.3 | Main outcomes

Raw means and standard deviations for each outcome variable at pre- and post-intervention are provided in Table 2. Results for regression analyses evaluating intervention effects for the primary outcomes, as well as effect sizes for group differences in adjusted post-treatment means, are presented in Table 3. Following Cohen's guidelines, an effect size of 0.20 is considered "small", 0.50 is "medium", and 0.80 is "large" (Cohen, 1988). Because three planned comparisons were conducted for each dependent variable, a Bonferroni adjusted criterion α of .0167 was utilized.

[1]A series of logistic regression analyses were run to test baseline outcome variables as predictors of dropout. No significant differences were found (p-values range = .14 to .96).

3.3.1 | Body dissatisfaction

The overall condition effect for body dissatisfaction was significant, Wald $\chi^2(2) = 17.71$, $p < .01$. Both CBI-I and DBI-I showed greater reductions in body dissatisfaction than NI. No difference was found between CBI-I and DBI-I.

3.3.2 | Thin-ideal internalization

The omnibus condition effect for thin-ideal internalization was significant, Wald $\chi^2(2) = 15.51$, $p < .01$. DBI-I and CBI-I were both more effective at reducing thin-ideal internalization than NI. Intervention effects did not differ between CBI-I and DBI-I.

3.3.3 | Composite eating pathology

For composite eating pathology, the omnibus condition effect was significant, Wald $\chi^2(2) = 11.76$, $p < .01$. Relative to NI, CBI-I participants showed greater reductions in composite eating pathology at post-treatment. No other group differences were found.

3.3.4 | Dieting

A significant overall condition effect was detected for dieting, Wald $\chi^2(2) = 10.07$, $p < .01$. CBI-I was more effective at reducing dieting than NI. No other group differences were detected.

3.3.5 | Depression

The omnibus condition effect for depression was significant, Wald $\chi^2(2) = 11.36$, $p < .01$. DBI-I and CBI-I both led to greater reductions in depression than NI. Again, no difference was found between DBI-I and CBI-I.

3.4 | Moderation analyses

The Ethnicity × DBI-I versus NI moderation effect, $B = 6.30$, $t(262) = 2.31$, $p = .02$, was significant for eating pathology. Post hoc analyses indicated that DBI-I was more effective at reducing eating pathology than NI for minorities, $t(178) = 2.78$, $p = .006$, but no intervention effect was found for Whites, $t(85) = .79$, $p = .43$. No eating pathology moderation effect was found for Ethnicity × CBT versus NI. For the depression outcome, significant moderation effects were found for the Ethnicity × DBI versus NI interaction, $B = 5.27$, $t(262) = 2.35$, $p = .03$,

TABLE 3 Regression results for primary study outcomes

Outcome	Treatment comparison	B	SE B	t	p	d
Body dissatisfaction	DBI-I versus CBI-I	−5.84	4.25	−1.38	.17	−.19
	DBI-I versus NI	11.23	4.19	2.68	.00782	.36
	CBI-I versus NI	17.08	4.13	4.13	.000049	.59
Thin-ideal internalization	DBI-I versus CBI-I	.70	.70	1.00	.32	.16
	DBI-I versus NI	2.59	.68	3.77	.000201	.61
	CBI-I versus NI	1.86	.67	2.75	.00637	.53
Eating pathology	DBI-I versus CBI-I	−2.03	1.34	−1.52	.13	−.29
	DBI-I versus NI	2.44	1.31	1.86	.06	.26
	CBI-I versus NI	4.47	1.31	3.42	.000724	.53
Dieting	DBI-I versus CBI-I	−1.53	1.02	−1.49	.14	−.19
	DBI-I versus NI	1.63	1.00	1.63	.10	.22
	CBI-I versus NI	3.16	.99	3.17	.001702	.41
Depression	DBI-I versus CBI-I	.09	1.17	.08	.94	.01
	DBI-I versus NI	3.32	1.14	2.91	.003919	.44
	CBI-I versus NI	3.22	1.13	2.85	.004713	.39

Note. CBI-I = Internet cognitive-behavioral treatment. DBI-I = Internet dissonance-based intervention. NI = no intervention. The DBI-I versus CBI-I contrast variable was dummy coded 0 = DBI-I, 1 = CBI-I. The DBI-I versus NI contrast variable was dummy coded 0 = DBI-I, 1 = NI. The CBI-I versus NI condition contrast variable.

as well as the Ethnicity × CBI-I versus NI interaction, $B = 4.91$, $t(262) = 2.35$, $p = .04$. Post hoc analyses indicated that DBI was more effective at reducing depression than NI for minorities, $t(178) = 3.51$, $p = .001$, but not for Whites, $t(85) = 1.66$, $p = .11$. In addition, CBI-I was more effective at reducing depression than NI for minorities, $t(178) = 3.43$, $p = .001$, while no effect was found for Whites, $t(85) = 1.67$, $p = .09$. Ethnicity did not moderate depression or eating pathology outcomes for the DBI-I versus CBI-I comparison.[2] No moderation effects were found for the remaining outcome measures.

4 | DISCUSSION

This randomized controlled trial evaluated two forms of Internet-based ED prevention with predominantly minority women—CBI-I and DBI-I. We hypothesized that CBI-I and DBI-I would be more effective than NI, and that DBI-I would be more effective than CBI-I. Overall, results supported the efficacy of Internet ED prevention, as intervention effects were significant for all measured outcomes. CBI-I and DBI-I were more effective than NI at reducing body dissatisfaction, thin-ideal internalization, and depression. Although CBI-I was more effective at reducing eating pathology and dieting than NI, DBI-I did not lead to improvements in either outcome for the overall sample. This study

[2]Supplementary analyses comparing Whites and Asians were conducted to examine whether the ethnic composition of the minority subsample affected study. The same pattern of significant results was found when we re-ran all of our moderator analyses with ethnicity operationalized as White versus Asian.

provides preliminary evidence that both Internet approaches are effective at reducing psychological risk factors for ED relative to control.

Effect sizes for CBI-I (vs. NT) were in the moderate range on average, with the largest effect occurring for body dissatisfaction ($d = 0.59$). Similarly, a prior trial of Internet CBT reported a larger effect for body dissatisfaction than for other outcomes (Heinicke, Paxton, McLean, & Wertheim, 2007). In addition, a meta-analysis for Student Bodies, an online CBT ED prevention program, reported effect sizes ranging from small to moderate (Beintner et al., 2012). Thus, it appears that effect sizes for CBI-I correspond with findings from past research. With the exception of thin-ideal internalization ($d = 0.61$), effect sizes for the DBI-I versus NT comparison were in the "small" range. This finding is theoretically consistent, as DBI-I content focuses primarily on the reduction of thin-ideal internalization (Stice et al., 2008), and thin-ideal internalization has been identified as a mediator of DBI-I outcomes. A prior trial of an Internet DBI program obtained an effect size of 0.63 for thin-ideal internalization at post-treatment (Stice et al., 2012), which is comparable to the current study. However, for other outcomes (e.g., body dissatisfaction, dieting, negative affect) effect sizes for the current study were smaller than those reported by Stice et al. (2012).

The utilization of two interventions matched in duration and structure was well suited to identifying differential effects. However, it is worth noting that both interventions were cognitively oriented. Though DBI-I adopted a sociocultural perspective, and CBI-I attended primarily to the internal emotional experience, both conditions actively encouraged participants to challenge previously held thoughts and assumptions about their bodies. In contrast with our hypotheses, CBI-I

was associated with larger treatment effects than DBI-I. The original DBI-I protocol relies heavily on group interaction through activities such as publicly denouncing the thin-ideal, engaging in role plays, and engaging in anti thin-ideal social activism (Stice et al., 2008). Thus, it is possible that lack of participant interaction in DBI-I contributed to attenuated treatment effects. However, it should be noted that Stice et al. (2014) reported equivalent effects for group face-to-face DBI and Internet DBI at post-treatment despite minimal participant interaction.

The results also indicated that DBI-I led to lower eating pathology than NI for minorities, while no intervention effects for this comparison were found for Whites. In addition, both active conditions were more effective at reducing depression than NI for minorities, whereas Whites did not experience intervention gains. The ethnic minority sample in this study was predominantly Asian, and previous research has found that Asian women tend to prefer a lower body weight and are more critical of their bodies than Whites (Kennedy et al., 2004; Soh et al., 2008). It is possible Asians experienced more psychological discomfort than Whites when prompted to argue against the thin-ideal, resulting in higher dissonance and superior intervention response. Supplementary moderation analyses were run comparing Whites versus Asians only, to determine if the obtained results were specific to Asian minorities. The results were comparable to moderation outcomes for the combined minority subsample. Thus, future research should consider that in certain contexts, encouraging minorities to argue against distressing, culturally relevant body ideals could enhance intervention outcomes. However, given that no ethnicity effects were found for three of the five outcomes, the lack of ethnicity effects for the CBI-I versus DBI-I comparisons, and the absence of ethnicity effects in prior treatment outcome reviews (Huey & Polo, 2008; Huey, Tilley, Jones, & Smith, 2014), these results must be interpreted cautiously.

4.1 | Study strengths and limitations

Because body ideals vary across ethnic groups (Grabe & Hyde, 2006; Roberts et al., 2006; Yates et al., 2004), it is important to ascertain whether conventional ED prevention programs are effective for participants from diverse cultural backgrounds. This is one of the few studies to support the efficacy of ED prevention in a predominantly minority sample (Rodriguez et al., 2008). Moreover, our research suggests that evidence-based ED interventions may be *more* efficacious for minorities than whites. Our study makes a significant contribution to the literature by directly comparing two alternate theoretical paradigms, a rare approach in the ED prevention literature. Furthermore, the study successfully implemented a brief, low-cost method of delivery via Internet-based intervention. As such, our research contributes to current knowledge regarding Internet-administered psychosocial interventions, the viability of alternative DBI and CBT formats, and ethnic minority response to online ED intervention.

Nonetheless, the current study has several limitations. Because our analyses do not include follow-up data, it is unclear whether intervention effects were sustained over time. Regarding treatment content, the study did not include therapeutic communications between participants and study personnel, nor did participant–participant interactions

take place (e.g., via discussion board or email). As past research has suggested that personal interaction enhances treatment outcomes (Stice, 2002), the inclusion of interactive elements might have led to larger intervention effects. Effects for the depression outcome were small, suggesting that the interventions may be most useful for addressing body image and eating-related outcomes. While our study attrition rate of 28% is comparable to previous Internet interventions (Cavanagh, 2010), the reduction in participants from pre- to post-treatment presents a notable limitation to our findings. Furthermore, both interventions were initially adapted for the purpose of comparing Internet DBI with Internet CBT in this study. It is possible that larger effects for CBI-I occurred for some outcomes because the intervention was adapted more successfully to Internet form, as opposed to superiority of the treatment paradigm.

FUTURE RESEARCH

Future studies should continue to utilize diverse study samples to examine ethnic differences in Internet ED prevention outcomes. In addition, Internet-based intervention studies should consider devising interactive elements to enhance intervention outcomes. We also recommend that comparative trials attempt to isolate specific ingredients that promote therapeutic change by identifying mechanisms of the respective treatments (e.g., via longitudinal mediation analyses).

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