Internet-delivered Eating Disorder Prevention: A Randomized Controlled Trial of Dissonance-based and Cognitive-behavioral Treatments

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Abstract

Dissonance-based intervention (DBI) and cognitive-behavioral treatment (CBT) are both efficacious for preventing eating disorders. However, no studies have examined the comparative effects of these interventions, and no evidence exists regarding the relative efficacy of DBI and CBT in a web-based format. Moreover, it is unclear if intervention effects for online eating disorder prevention generalize to non-Whites, as few trials examine outcomes for ethnic minority samples. The current study evaluated two web-based programs for eating disorder prevention in high-risk women. Two hundred and seventy-one predominantly ethnic minority women with elevated weight concerns were randomized to Internet dissonance-based intervention (DBI-I), Internet cognitive-behavioral treatment (CBT-I), or no treatment (NT). Thin-ideal internalization and body dissatisfaction were evaluated as potential mediators of treatment effects. At post-treatment, DBI-I and CBT-I led to greater reductions in body dissatisfaction, thin-ideal internalization, and depression than NT. In addition, CBT-I was effective at reducing dieting and composite eating pathology relative to NT. No outcome differences were found between the active conditions. Although body dissatisfaction emerged as a mediator of select treatment effects, mediation analyses for thin-ideal internalization were non-significant. Results suggest that both DBI-I and CBT-I are effective at reducing eating disorder risk factors in a high-risk, minority population relative to no treatment.

Keywords: dissonance-based intervention, cognitive-behavioral treatment, Internet, eating disorder prevention, randomized controlled trial
Eating disorders (EDs) are among the most severe and debilitating mental health syndromes. Due to pronounced physiological damage caused by controlled eating, 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, including depression and suicidal behavior (Hudson, Hiripi, & Kessler, 2007; Johnson, Cohen, Kasen, & Brook, 2002). Given the substantial social, psychological, and economic costs attributed to EDs, various behavioral interventions have focused on ED prevention (Loucas et al., 2014). The two approaches applied most frequently to ED prevention are dissonance-based intervention (DBI) and cognitive-behavioral treatment (CBT).

DBI is a well-validated treatment for the prevention of EDs that encourages participants to actively argue against the media-propagated thin ideal body type (Stice et al., 2007; Stice, Mazotti, Weibel, & Agras, 2000). DBIs are informed by cognitive-dissonance theory, which posits that discrepancy between beliefs and behaviors fosters psychological discomfort (Festinger, 1957). This discomfort engenders motivation to change one’s attitudes, beliefs, or behaviors in accordance with a single viewpoint. When participants with body image concerns engage in activities that argue against the thin ideal, their beliefs and attitudes should then 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 (Stice, Shaw, Becker, & Rohde, 2008), and may also be superior to alternative treatment approaches (e.g., healthy weight control, mindfulness; Stice et
CBT for ED is based on the premise that psychological risk factors (e.g., fear of fatness, concern with body size/shape) increase vulnerability to negative self-schemas involving body image and eating (Williamson, White, York-Crowe, & Stewart, 2004). Maladaptive eating behaviors, such as dieting, binge eating, and purging, 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, 1997). Meta-analytic research has reported positive treatment outcomes for CBT ED prevention programs (Beintner, Jacobi, & Taylor, 2012).

Despite consistent support for both interventions, several notable gaps exist in the literature. First, no studies to date have directly compared outcomes for these distinct approaches to ED prevention. Due to the widespread implementation of the treatment vs. control study design in the ED literature, little is known about the relative efficacy of different ED intervention strategies. Indeed, 75% of studies included in a 2014 meta-analysis of electronic ED prevention programs compared an active treatment with a no-treatment or placebo control group (Loucas et al., 2014). As DBI and CBT are the most well-validated eating disorder prevention approaches to date, it is crucial to elucidate potential differences in outcomes between the two treatments.

Second, the external validity of earlier findings is questionable because ethnic minorities are mostly missing from ED prevention trials (Chithambo & Huey, 2016; Fingeret et al., 2006). Though two studies report equivalent DBI ED prevention effects for Whites and minorities (Rodriguez; Marchand, Ng, & Stice, 2008; Stice, Marti, & Cheng, 2014), samples for the studies were 77% and 75% White, potentially compromising the generalizability of the reported
outcomes. Furthermore, research has identified discrepancies in body image ideals between ethnic groups (Grabe & Hyde, 2006; Roberts, Cash, Feingold, & Johnson, 2006; Yates, Edman, & Aruguete, 2004). As many ED prevention programs address thoughts and emotions associated with poor body image (Beintner, Jacobi, & Taylor, 2012; Stice, Mazotti, Weibel, & Agras, 2000), it is important to ascertain that findings indicating positive eating disorder prevention effects can be generalized to members of diverse populations.

The current study compared the efficacy of Internet-based DBI (DBI-I) and CBT (CBT-I) in a sample of predominantly minority women at-risk for EDs. We focused on Internet-based prevention approaches for several reasons. First, limited evidence suggests that electronic and face-to-face ED interventions are similarly effective at preventing eating disorders (Paxton, 1993; Paxton, 1996; Paxton, McLean, Gollings, Faulkner, & Wertheim, 2007; Stice et al., 2012). For example, Stice and colleagues (2012) reported that both face-to-face and online DBI protocols produced comparable, positive effects for thin-ideal internalization, body dissatisfaction, negative affect, and ED symptoms at post-treatment. Second, given low rates of treatment utilization among women at risk for EDs (Cachelin, Rebeck, Veisel, & Striegel-Moore, 2001), Internet-based intervention can reduce barriers to treatment access by providing enhanced privacy and convenience of access.

Regarding expected treatment outcomes, we hypothesized that both CBT-I and DBI-I would reduce eating disorder risk factors when compared to NT. Moreover, body dissatisfaction and thin-ideal internalization were tested as mediators of the effect of condition (DBI-I vs. CBT-I) on eating behaviors to examine potential treatment mechanisms. Specifically, where outcomes favoring CBT-I occurred, we predicted that the effect would be mediated by change in body dissatisfaction, per the CBT model of EDs; where outcomes favoring DBI-I occurred, we
predicted that the effect would be mediated by change in thin ideal internalization, in accordance
with the dissonance-based model of EDs. Additional mediation analyses were conducted to
evaluate whether body dissatisfaction and/or thin-ideal internalization mediated the relative
effect of the active treatment conditions when compared to NT.

Methods

Participants

Participants were students at a large, private university in Southern California. Because
eating pathology is rare among males (Hudson, Hiripi, Pope, & Kessler, 2007), and because
intervention content focused on female body weight and shape, only women were included. As
preoccupation with body shape and weight is a diagnostic criterion for anorexia nervosa and
bulimia nervosa (American Psychiatric Association, 2013), the Weight Concerns Scale was used
to screen for eating disorder risk (WCS; Killen et al., 1994). Participants with a score of 34 (the
mean score for a community sample of adolescent females; Killen et al., 1996) or higher were
eligible 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; Barr Taylor et al., 2006).

As both active interventions are preventive in focus, individuals who exhibited severe
eating pathology, as indicated by a score of 20 or higher on the Eating Attitudes Test (Garner,
Olmstead, Bohr, & Garfinkle, 1982), were excluded from the study. 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). Participants excluded due to ED pathology or suicidal ideation were provided with
referral information to local treatment providers. In addition to providing referral information
online, we called participants who expressed suicidal ideation \((n=1)\) in order to assess risk and assure safety.

**Procedures**

**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.

**Design.** The study adopted a 3 (Treatment condition: DBI-I, CBT-I, NT) X 2 (Time: pre-treatment, post-treatment) design, with participants randomized to DBI-I, CBT-I, or NT. In total, 271 individuals were recruited, exceeding the number required to detect a moderate effect at the \(p < .05\) level \((n = 168;\) GPower Statistical Software package, Faul, Erdfelder, Lang, & Buchner, 2007). For all study conditions, outcome measures were collected on two occasions. Time 1 data collection took place immediately prior to the first treatment session (Baseline; T1). Time 2 data collection occurred four weeks later, following the fourth and final treatment session (Post-treatment; T2). Participants in the control condition were assessed on the same schedule, with T2 scheduled four weeks after T1.

Eligible subjects 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. Excluding the assessment battery, the sessions and corresponding homework assignments were designed to require approximately 1 hour a week of participation. Those in the active treatment conditions received five research
credits (.5 credits for each assessment and 1 credit for each session), while NT participants received 1 credit. For all participants, credits were administered upon completion of the T2 assessment. Study procedures were approved by the university institutional review board.

**Intervention Conditions**

**DBI-I.** 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 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).

**CBT-I.** CBT-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. CBT-I content was derived primarily from sections of *The Body Image Workbook*, a self-help manual for body dissatisfaction (Cash, 1997).

**NT.** NT participants did not engage in any intervention activities; rather, their participation consisted solely of completing the T1 and T2 assessment measures.

**Measures**

**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.
**Body dissatisfaction.** The 34-item Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) assessed weight and shape concerns. 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 alpha at baseline for the current study was .96.

**Thin-ideal internalization.** The revised Ideal Body Stereotype Scale (IBSS; Stice, Ziemba, Margolis, & Flick, 1996) measured idealization of a slim female physique. 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 alpha of .73 was obtained.

**Composite eating pathology.** The Eating Attitudes Test (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., 1982). The reliability coefficient was .81.

**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 alpha was .88.

**Depressive symptoms.** The 21-item Beck Depression Inventory-II (BDI-II; Beck et al., 1996) was used as a measure of depressive symptoms over the past week. 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 alpha for the study sample was .90.

*I changed the order to mediators first, then ultimate outcomes in order of theoretical*
Analyses

**Main outcomes.** To evaluate the effect of treatment condition on the primary study outcomes, we regressed each dependent variable on two dummy-coded vectors representing treatment condition, with baseline scores for each respective outcome included as covariates in the model. Wald $\chi^2$ 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.

**Mediation analyses.** Preacher, Rucker, and Hayes (2007) have recommended bootstrapping for mediation analysis, as the procedure adopts no assumptions regarding the shape of the sampling distribution. In bootstrapping mediation analysis, a sampling distribution of the indirect effect is estimated by calculating the indirect effect $ab$ in randomly generated subsamples of the original dataset (Preacher et al., 2007). For each resample, an indirect effect $a^+b^+$ is computed, a quantity derived from the resampled dataset rather than the original sample (Preacher et al., 2007). The null hypothesis of no indirect effect is rejected if 0 lies outside of the 95% confidence interval for the resampled datasets (Preacher et al., 2007). 95% CIs were calculated for the $a$, $b$, and $ab$ regression pathways.

A multiple mediation approach was employed, where thin-ideal internalization and body dissatisfaction were entered into the model as mediators simultaneously. In addition to reducing the parameter bias that occurs when mediators are examined in separate models, this approach facilitated examination of the relative magnitudes of the mediating effects (Preacher & Hayes, 2008).

**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 not be known, this is a more flexible approach to obtaining 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.

**Results**

**Baseline Characteristics**

See Figure 1 for a CONSORT diagram of participant flow through the study. 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 BMI was 22.04($SD=3.69$), a value in the “healthy weight” category (Centers for Disease Control and Prevention, 2015). A series of one-way ANOVA analyses showed marginally significant differences in pre-treatment BDI by treatment condition, $F(2, 268)=2.833$, $p=.06$. Post-hoc analyses revealed that BDI scores were marginally lower for CBT-I participants than DBI-I participants. No other group differences in baseline pathology or demographic characteristics were found.

**Attrition**
Seventy-two percent of participants \((n=195)\) completed the post-treatment assessment. Dropout rates for DBI-I, CBT-I, and NT 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.

**Main Outcomes**

Raw means and standard deviations for each outcome variable at pre- and post-treatment are provided in Table 2. Results for regression analyses evaluating treatment 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 alpha of .0167 was utilized.

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

**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 NT. Intervention effects did not differ between CBT-I and DBI-I.

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

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

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

**Mediation Analyses**

Because CBT-I and DBI-I did not show outcome differences for either mediator variable (i.e., body dissatisfaction and thin-ideal internalization), mediation analyses for this comparison were precluded (Shrout & Bolger, 2002). Therefore, mediation analyses were only conducted for the CBT-I/NT and DBI-I/NT predictor variables. Although DBI did not lead to reductions in eating pathology or dieting when compared to NT, mediation analyses were carried out because modern statistical theory suggests that a direct predictor $\rightarrow$ outcome relationship is not a necessary condition for establishing mediation (see Zhao, Lynch, & Chen, 2010 for further details). Pre-treatment mediator and outcome scores were included in all models as covariates. Total (i.e., combined) and specific effects for the two mediating variables were evaluated. A contrast parameter estimate was generated to test for differences in the magnitude of the mediation effects.

**Composite eating pathology.** The CBT-I/NT and DBI-I/NT dummy variables were tested as predictors of composite eating pathology in two separate mediation models (Table 4). For the CBT-I/NT predictor, the total mediation effect for body dissatisfaction and thin-ideal internalization was significant. The specific mediation effect for body dissatisfaction was significant, while the specific mediation effect for thin-ideal internalization was not. Furthermore, the mediation contrast coefficient was significant, indicating that the mediation effect for body dissatisfaction was larger than that of thin-ideal internalization.
The total mediation effect for the DBI-I/NT comparison was significant. A significant specific mediation effect was found for body dissatisfaction, but not for thin-ideal internalization. A significant mediation contrast effect was found, again indicating that the mediation effect for body dissatisfaction was larger than that of thin-ideal internalization.

**Dieting.** For the CBT-I/NT comparison, the total mediation effect of body dissatisfaction and thin-ideal internalization was significant. The specific mediation effect for body dissatisfaction was significant, while the specific mediation effect for thin-ideal internalization was not. The mediation contrast coefficient was significant, indicating that the mediation effect for body dissatisfaction was larger than that for thin-ideal internalization.

The total mediation effect was also significant for the DBI-I/NT predictor. The specific mediation effect for body dissatisfaction was significant, and no specific mediation effect was found for thin-ideal internalization. The mediation contrast was non-significant, suggesting that the mediation effects did not differ in magnitude.

**Statistically Reliable Change**

We followed guidelines provided by Jacobson and Truax (1991) to calculate the Reliable Change Index (RC) from pre-treatment to post-treatment (Table 6). The index provides a metric for examining whether changes in outcomes are clinically significant. RC was derived using the conservative approach to calculating the standard error of measurement of the difference recommended by Maassen (2004). The omnibus condition effect for reliable change was significant for body dissatisfaction and thin-ideal internalization. Rates of reliable change for these outcomes were significantly higher for participants in either of the active treatment conditions when compared to NT. Reliable change frequencies did not differ between CBT-I and DBI-I for any outcome.
Discussion

This randomized controlled trial evaluated two forms of Internet-based ED prevention with predominantly minority women – CBT-I and DBI-I. Overall, results supported the efficacy of Internet ED prevention, as treatment effects were significant for all measured outcomes. Both CBT-I and DBI-I were more effective than NT at reducing body dissatisfaction, thin-ideal internalization, and depression. Although CBT-I was more effective at reducing eating pathology and dieting than NT, DBI-I did not lead to improvements in either outcome. No significant differences were found between CBT-I and DBI-I. Thus, this study provides preliminary evidence that while both Internet approaches are effective at reducing psychological risk factors for ED relative to control, only Internet CBT is effective at addressing problematic eating behaviors as well.

Body dissatisfaction mediated effects favoring each of the active conditions (CBT-I and DBI-I) over NT for eating pathology and dieting. Prior ED prevention programs with diverse theoretical perspectives have identified body dissatisfaction as a mediator of treatment outcomes (Seidel et al., 2009; Dingemans et al., 2007). In the current study, both interventions focused heavily on challenging pre-existing body image beliefs and encouraged participants to consider how body image affects interpersonal relationships. Given that body dissatisfaction is a robust predictor of ED onset (Stice, Marti, & Durant, 2007), it stands to reason that addressing body dissatisfaction may be a critical component of ED prevention across treatment paradigms.

In contrast with prior DBI research (Stice et al, 2007; Stice et al., 2011), thin-ideal internalization did not mediate treatment effects. This may suggest that cultural factors are less proximal to the development of ED symptoms than body dissatisfaction. It is also noteworthy that prior investigations detecting thin-ideal mediation effects have recruited study populations
with minimal pre-treatment pathology (Stice et al., 2007; Stice et al., 2011), while elevated
weight concerns were a requirement for inclusion in the current study. Accordingly, the
influence of thin-ideal internalization as a mechanism of eating pathology may be attenuated in
higher risk samples.

Considering that no differences in treatment mechanisms were found between the
interventions, it is possible that common factors accounted for therapeutic change in both
conditions. For example, the therapeutic alliance is frequently cited as a mechanism of change
across psychotherapeutic approaches (Elvins & Green, 2008; Kazdin, 2007). However, given the
remote nature of treatment delivery and the limited contact between participants and personnel in
both intervention conditions, other factors may be more relevant to the current study. Potential
therapeutic mechanisms present in both conditions include 1) persuading participants to change;
2) enhancement of personal and emotional learning; 3) fostering insight and awareness; and 4)
provision of information and education (Tracey, Lichtenberg, & Goodyear, 2003). It is also
worth noting that both interventions were cognitively oriented. Though DBI-I adopted a
sociocultural perspective, and CBT-I attended primarily to the internal emotional experience,
both conditions actively encouraged participants to challenge previously held thoughts and
assumptions about their bodies. These shared qualities might account for the lack of mechanism
specificity between the two interventions.

Several limitations of the study exist. Because our analyses do not include follow-up
data, it is unclear whether treatment effects were sustained over time. Future research should
examine the long-term effects of both treatment conditions. Regarding treatment content, the
study did not include therapeutic communications between participants and study personnel, nor
did participant-participant interactions take place (e.g., discussion board, email). Because past
research has suggested that personal interaction enhances treatment outcomes (Stice et al., 2007), it is possible that the inclusion of interactive elements would have led to larger treatment effects.

**Study Strengths**

Because body ideals vary between ethnic groups (Grabe & Hyde, 2006; Roberts, Cash, Feingold, & Johnson, 2006; Yates, Edman, & Aruguete, 2004), it is important to ascertain whether conventional ED prevention programs are effective for participants from diverse cultural backgrounds. This is one of few studies to support the efficacy of ED prevention in a predominantly minority sample (Rodriguez, Marchand, Ng, & Stice, 2008; Stice, Marti, & Cheng, 2014). Future studies should utilize diverse study samples to examine ethnic differences in Internet ED prevention outcomes. Also, as research has indicated that some minority groups place less value on their weight and shape in judging their self-image than Whites (e.g., Chithambo & Huey, 2013), future trials should investigate whether mechanisms of treatment (e.g., change in body dissatisfaction) vary between ethnic groups.

The study provides support for Internet intervention as an efficacious strategy for reducing body image and eating pathology. Despite minimal social interaction and a self-guided format, significant omnibus intervention effects were obtained. The automated features of the active interventions allowed us to disseminate the program with minimal overhead costs when compared to face-to-face intervention. Automation of program components also ensured that each participant received a similar version of the intervention, reducing the influence of therapist-specific traits on study outcomes (Kim, Wampold, & Bolt, 2006).

Regarding potential implications of the present study, as EDs are among the most expensive psychological disorders to treat and require highly intensive services (Striegel-Moore, Leslie, Petrill, Garvin, & Rosenheck, 2000), Internet-based protocols might alleviate public
healthcare expenses associated with ED treatment at minimal cost to patients and service providers. This research contributes to current knowledge regarding ED prevention, Internet-administered psychosocial interventions, and the viability of alternative DBI and CBT formats. Also, our study makes a significant contribution to the literature by directly comparing two alternate theoretical paradigms, a rare approach in the ED prevention literature. We recommend that treatment researchers continue to implement controlled trials that compare active interventions in order to isolate specific ingredients that promote therapeutic change.
References


Rodriguez, R., Marchand, E., Ng, J., & Stice, E. (2008). Effects of a cognitive dissonance-based eating disorder prevention program are similar for Asian American, Hispanic, and White


### Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Total (n=271)</th>
<th>DBI-I (n=90)</th>
<th>CBT-I (n=88)</th>
<th>NT (n=93)</th>
<th>F</th>
<th>χ²</th>
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</thead>
<tbody>
<tr>
<td>Age (years), M(SD)</td>
<td>20.85 (3.15)</td>
<td>20.63 (3.62)</td>
<td>21.32 (3.82)</td>
<td>20.60 (1.55)</td>
<td>.89</td>
<td>-</td>
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<tr>
<td>Body Mass Index (BMI), M(SD)</td>
<td>22.04 (3.69)</td>
<td>22.21 (3.69)</td>
<td>22.29 (3.27)</td>
<td>21.64 (4.07)</td>
<td>1.03</td>
<td>-</td>
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<tr>
<td>Ethnicity</td>
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<tr>
<td>Asian, n (%)</td>
<td>110 (40.6)</td>
<td>39 (43.3)</td>
<td>34 (38.6)</td>
<td>37 (39.8)</td>
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<tr>
<td>White, n (%)</td>
<td>89 (32.8)</td>
<td>26 (28.9)</td>
<td>31 (35.2)</td>
<td>32 (34.4)</td>
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<tr>
<td>Latino, n (%)</td>
<td>32 (11.8)</td>
<td>11 (12.2)</td>
<td>13 (14.8)</td>
<td>8 (8.6)</td>
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<td>Black, n (%)</td>
<td>16 (5.9)</td>
<td>7 (7.8)</td>
<td>5 (5.7)</td>
<td>4 (4.3)</td>
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<td>Multi-ethnic, n (%)</td>
<td>20 (7.4)</td>
<td>5 (5.6)</td>
<td>5 (5.7)</td>
<td>10 (10.8)</td>
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<tr>
<td>Other, n (%)</td>
<td>4 (1.5)</td>
<td>2 (2.2)</td>
<td>0 (0.0)</td>
<td>2 (2.2)</td>
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Note. BMI = body mass index. CBT-I = Internet cognitive-behavioral treatment. DBI-I = Internet dissonance-based intervention. NT = no treatment.
Table 2

*Raw Means and Standard Deviations of Primary Outcome Variables at Each Time Point*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Post-treatment</th>
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<tr>
<td></td>
<td>DBI-I (n=90)</td>
<td>CBT-I (n=88)</td>
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<tr>
<td>Body Dissatisfaction, M(SD)</td>
<td>100.62 (28.61)</td>
<td>97.26 (26.27)</td>
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<tr>
<td>Thin-Ideal Internalization, M(SD)</td>
<td>24.11 (2.94)</td>
<td>23.18 (3.27)</td>
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<tr>
<td>Eating Pathology, M(SD)</td>
<td>9.03 (6.55)</td>
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<td>Dieting, M(SD)</td>
<td>29.02 (5.95)</td>
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<td>Depression, M(SD)</td>
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</tbody>
</table>

*Note.* DBI-I = Internet dissonance-based intervention. CBT-I = Internet cognitive-behavioral treatment. NT = no treatment. Post-treatment means and standard deviations are reported for completers of each assessment period.
Table 3

Regression Results for Primary Study Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Treatment Comparison</th>
<th>B</th>
<th>SE B</th>
<th>t</th>
<th>d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body dissatisfaction</td>
<td>DBI-I vs. CBT-I</td>
<td>-5.84</td>
<td>4.25</td>
<td>-1.38</td>
<td>-.19</td>
<td>.17</td>
</tr>
<tr>
<td></td>
<td>DBI-I vs. NT</td>
<td>11.23</td>
<td>4.19</td>
<td>2.68</td>
<td>.36</td>
<td><strong>.01</strong>*</td>
</tr>
<tr>
<td></td>
<td>CBT-I vs. NT</td>
<td>17.08</td>
<td>4.13</td>
<td>4.13</td>
<td>.59</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Thin-ideal Internalization</td>
<td>DBI-I vs. CBT-I</td>
<td>0.70</td>
<td>.70</td>
<td>1.00</td>
<td>.16</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>DBI-I vs. NT</td>
<td>2.59</td>
<td>.68</td>
<td>3.77</td>
<td>.61</td>
<td><strong>&lt;.001</strong>*</td>
</tr>
<tr>
<td></td>
<td>CBT-I vs. NT</td>
<td>1.86</td>
<td>.67</td>
<td>2.75</td>
<td>.53</td>
<td><strong>.01</strong>*</td>
</tr>
<tr>
<td>Eating pathology</td>
<td>DBI-I vs. CBT-I</td>
<td>-2.03</td>
<td>1.34</td>
<td>-1.52</td>
<td>-.29</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>DBI-I vs. NT</td>
<td>2.44</td>
<td>1.31</td>
<td>1.86</td>
<td>.26</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>CBT-I vs. NT</td>
<td>4.47</td>
<td>1.31</td>
<td>3.42</td>
<td>.53</td>
<td><strong>&lt;.001</strong>*</td>
</tr>
<tr>
<td>Dieting</td>
<td>DBI-I vs. CBT-I</td>
<td>-1.53</td>
<td>1.02</td>
<td>-1.49</td>
<td>-.19</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>DBI-I vs. NT</td>
<td>1.63</td>
<td>1.00</td>
<td>1.63</td>
<td>.22</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>CBT-I vs. NT</td>
<td>3.16</td>
<td>.99</td>
<td>3.17</td>
<td>.41</td>
<td><strong>.002</strong>*</td>
</tr>
<tr>
<td>Depression</td>
<td>DBI-I vs. CBT-I</td>
<td>.09</td>
<td>1.17</td>
<td>.08</td>
<td>.01</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td>DBI-I vs. NT</td>
<td>3.32</td>
<td>1.14</td>
<td>2.91</td>
<td>.44</td>
<td><strong>.004</strong>*</td>
</tr>
<tr>
<td></td>
<td>CBT-I vs. NT</td>
<td>3.22</td>
<td>1.13</td>
<td>2.85</td>
<td>.39</td>
<td><strong>.005</strong>*</td>
</tr>
</tbody>
</table>

Note. *p<.0167 (Bonferroni corrected). CBT-I=Internet cognitive-behavioral treatment. DBI-I=Internet dissonance-based intervention. NT=no treatment. The DBI-I vs. CBT-I contrast variable was dummy coded 0=DBI-I, 1=CBT-I. The DBI-I vs. NT contrast variable was dummy coded 0=DBI-I, 1=DBI-I. The CBT-I vs. NT condition contrast variable was dummy coded 0=CBT-I, 1=NT.
### Table 4

**Tests of Mediators of the Association Between Treatment Condition and Eating Pathology**

<table>
<thead>
<tr>
<th>Treatment Comparison</th>
<th>Mediator</th>
<th>Point Estimate</th>
<th>Product of Coefficients</th>
<th>Bootstrapping BC 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SE</td>
<td>Est./SE</td>
<td>Lower</td>
</tr>
<tr>
<td>Indirect Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT-I/NT</td>
<td>Body dissatisfaction</td>
<td>2.86</td>
<td>.95</td>
<td>3.03*</td>
</tr>
<tr>
<td></td>
<td>Thin-ideal internalization</td>
<td>-.01</td>
<td>.29</td>
<td>-.02</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.85</td>
<td>.89</td>
<td>3.18*</td>
</tr>
<tr>
<td></td>
<td>Contrast</td>
<td>2.87</td>
<td>1.08</td>
<td>2.67*</td>
</tr>
<tr>
<td>Indirect Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBI-I/NT</td>
<td>Body dissatisfaction</td>
<td>2.16</td>
<td>.93</td>
<td>2.32*</td>
</tr>
<tr>
<td></td>
<td>Thin-ideal internalization</td>
<td>-.26</td>
<td>.36</td>
<td>-.72</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1.89</td>
<td>.89</td>
<td>2.13*</td>
</tr>
<tr>
<td></td>
<td>Contrast</td>
<td>2.42</td>
<td>1.09</td>
<td>2.22*</td>
</tr>
</tbody>
</table>

*Note.* Figures in bold indicate that the 95% CI that does not include zero (i.e., p < .05). BC=bias corrected. CBT-I=Internet cognitive-behavioral treatment. DBI-I=Internet dissonance-based intervention. NT=no treatment. The CBT-I vs. NT condition contrast variable was dummy coded 0=CBT-I, 1=NT. The DBI-I vs. NT condition contrast variable was dummy coded 0=DBI-I, 1=NT.
Table 5

Tests of Mediators of the Association Between Treatment Condition and Dieting

<table>
<thead>
<tr>
<th>Treatment Comparison</th>
<th>Mediator</th>
<th>Point Estimate</th>
<th>Product of Coefficients</th>
<th>Bootstrapping BC 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SE</td>
<td>Est./SE</td>
<td>Lower</td>
</tr>
<tr>
<td>Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT-I/NT</td>
<td>Body dissatisfaction</td>
<td>2.55</td>
<td>.73</td>
<td>3.50*</td>
</tr>
<tr>
<td></td>
<td>Thin-ideal internalization</td>
<td>.25</td>
<td>.26</td>
<td>.97</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.79</td>
<td>.77</td>
<td>3.64*</td>
</tr>
<tr>
<td>Contrast</td>
<td></td>
<td>2.29</td>
<td>.77</td>
<td>2.98*</td>
</tr>
<tr>
<td></td>
<td>Indirect Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBI-I/NT</td>
<td>Body dissatisfaction</td>
<td>1.51</td>
<td>.67</td>
<td>2.26*</td>
</tr>
<tr>
<td></td>
<td>Thin-ideal internalization</td>
<td>.51</td>
<td>.40</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.03</td>
<td>.78</td>
<td>2.61*</td>
</tr>
<tr>
<td>Contrast</td>
<td></td>
<td>.99</td>
<td>.78</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Note. Figures in bold indicate that the 95% CI that does not include zero (i.e., p < .05). BC = bias corrected. CBT-I = Internet cognitive-behavioral treatment. DBI-I = Internet dissonance-based intervention. NT = no treatment. The CBT-I vs. NT condition contrast variable was dummy coded 0 = CBT-I, 1 = NT. The DBI-I vs. NT condition contrast variable was dummy coded 0 = DBI-I, 1 = NT.
Table 6

Rates of Statistically Reliable Change by Condition

<table>
<thead>
<tr>
<th>Study Outcome</th>
<th>DBI-I n=62</th>
<th>CBT-I n = 64</th>
<th>NT n =69</th>
<th>$\chi^2(2)$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body dissatisfaction</td>
<td>21 (33.8)</td>
<td>15 (23.4)</td>
<td>6 (8.7)</td>
<td>12.45</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Thin-ideal internalization</td>
<td>12 (19.4)</td>
<td>6 (9.5)</td>
<td>1 (1.4)</td>
<td>11.86</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Eating pathology</td>
<td>5 (8.1)</td>
<td>5 (7.9)</td>
<td>6 (8.7)</td>
<td>.03</td>
<td>.99</td>
</tr>
<tr>
<td>Dieting</td>
<td>16 (26.2)</td>
<td>19 (29.7)</td>
<td>11 (15.9)</td>
<td>3.78</td>
<td>.15</td>
</tr>
<tr>
<td>Depression</td>
<td>8 (12.9)</td>
<td>10 (15.9)</td>
<td>8 (11.6)</td>
<td>.54</td>
<td>.76</td>
</tr>
</tbody>
</table>

Note. *p < .001. CBT-I = Internet cognitive-behavioral treatment. DBI-I = Internet dissonance-based intervention. NT = no treatment. Reliable Change was calculated for participants who completed the post-treatment assessment.
Figure 1. Participant flow chart. CBT-I = Internet cognitive-behavioral treatment; DBI-I = Internet dissonance-based intervention; EAT = Eating Attitudes Test. NT = no treatment.