

The empirical status of the third-wave behaviour therapies for the treatment of eating disorders: A systematic review

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Abstract

Although third-wave behaviour therapies are being increasingly used for the treatment of eating disorders, their efficacy is largely unknown. This systematic review and meta-analysis aimed to examine the empirical status of these therapies. Twenty-seven studies met full inclusion criteria. Only 13 randomized controlled trials (RCT) were identified, most on binge eating disorder (BED). Pooled within- (pre-post change) and between-groups effect sizes were calculated for the meta-analysis. Large pre-post symptom improvements were observed for all third-wave treatments, including dialectical behaviour therapy (DBT), schema therapy (ST), acceptance and commitment therapy (ACT), mindfulness-based interventions (MBI), and compassion-focused therapy (CFT). Third-wave therapies were not superior to active comparisons generally, or to cognitive-behaviour therapy (CBT) in RCTs. Based on our qualitative synthesis, none of the third-wave therapies meet established criteria for an empirically supported treatment for particular eating disorder subgroups. Until further RCTs demonstrate the efficacy of third-wave therapies for particular eating disorder subgroups, the available data suggest that CBT should retain its status as the recommended treatment approach for bulimia nervosa (BN) and BED, and the front running treatment for anorexia nervosa (AN) in adults, with interpersonal psychotherapy (IPT) considered a strong empirically-supported alternative.

Keywords: third-wave therapies; eating disorders; systematic review; cognitive-behaviour therapy; interpersonal psychotherapy

In the context of eating disorders, there are few empirically-supported treatments, defined as specific treatments shown to be effective in controlled research trials (Chambless & Hollon, 1998). High quality systematic reviews have demonstrated that specific forms of cognitive-behavioural therapy (CBT) are efficacious for a range of eating disorder presentations in the short and long-term (e.g., Brownley et al., 2016; National Institute of Clinical Excellence, 2017). There is also evidence that there are no statistically significant outcome differences between CBT and interpersonal psychotherapy (IPT) at long-term follow-up periods (Linardon, Wade, De la Piedad Garcia, & Brennan, 2017a). International clinical guidelines for eating disorders now recommend the use of psychological treatments that show strong empirical support, although some recommendations are also non-evidence based and likely reflect the particularities in healthcare systems (e.g., availability of outpatient services, amount of therapists trained in a particular theoretical orientation etc; see Hilbert, Hoek, & Schmidt, 2017). From eight available clinical guidelines that recommend psychological treatments for eating disorders, all recommend CBT for bulimia nervosa (BN) and binge eating disorder (BED), and six recommend CBT for anorexia nervosa (AN). Four clinical guidelines recommend IPT for BN and BED, and two recommend IPT for AN. Family-based therapy, particularly for adolescents, is recommended by six and four guidelines for AN and BN, respectively. Other interventions recommended less frequently by clinical guidelines include psychodynamic therapy and MANTRA (see Hilbert et al., 2017).

Although the efficacy of specific psychological treatments, such as CBT, IPT, and FBT, has been demonstrated in numerous randomized controlled trials (RCTs), there is still room for improvement in treatment retention and outcomes. For example, attrition, relapse, and/or partial response is common in RCTs evaluating CBT and IPT (e.g., Agras, Walsh, Fairburn, Wilson, & Kraemer, 2000), although there is evidence to suggest that treatment outcome and retention rates are improving when new and enhanced versions of CBT (CBT-

E) are delivered (Fairburn et al., 2015)¹. Some authors have therefore argued that a broader range of effective eating disorder treatments are needed (Wonderlich et al., 2014). The “third-wave” behavioural therapies have been suggested as potential alternatives for the treatment of eating disorders (Juarascio, Manasse, Schumacher, Espel, & Forman, 2017).

In general, while third-wave behaviour therapies have retained many of the same components as “second wave” CBT (e.g., self-monitoring, exposure and response prevention), they also use new methods and assumptions to achieve improvements in psychological functioning and clinical change (Hayes, 2004). Whereas CBT directly targets the content and validity of cognitive processes, third-wave therapies target the function or awareness of cognitions and emotions (Hofmann & Asmundson, 2008). Consequently, third-wave therapies emphasise strategies that foster acceptance, mindfulness, metacognition, and psychological flexibility, and reduce experiential avoidance (Hayes, Villatte, Levin, & Hildebrandt, 2011). This means that third-wave therapies target *response-focused* emotion regulation strategies, i.e., strategies that modulate the expression or experience of emotion regulation after its initiation, whereas CBT targets antecedent-focused emotion regulation strategies, i.e., strategies that prevent the emotion response from being activated (Hofmann & Asmundson, 2008).

There are some differences of opinion regarding the therapeutic interventions that fall under the category of third-wave behaviour therapies (Kahl, Winter, & Schweiger, 2012). However, a general consensus is that acceptance and commitment therapy (ACT), dialectical behaviour therapy (DBT), compassion mind training/compassion-focused therapy (CFT), mindfulness-based interventions (MBI), functional analytic therapy (FAP), schema therapy

¹ CBT-BN, the leading evidence-based treatment for BN, was enhanced (CBT-E) to not only make it a suitable treatment for all eating disorder presentations, but to consider and address the role of additional maintaining mechanisms that are thought to operate in a subset of individuals. These additional maintaining mechanisms include mood intolerance, interpersonal difficulties, clinical perfectionism, and core low self-esteem.

(ST), and metacognitive therapy (MT)² all fall under the third-wave behaviour therapy umbrella (Hayes, 2004; Hayes et al., 2011; Öst, 2008). These specific therapeutic interventions will therefore form the basis of this review.

Numerous systematic reviews and meta-analyses have examined the efficacy of third-wave therapies for several common mental health conditions. Dimidjian and colleagues recently synthesised the evidence from all the available meta-analyses (k=26) of third-wave therapies (Dimidjian et al., 2016). Most meta-analyses were based on third-wave therapies for mood and anxiety disorders, with only a small number considering personality, substance abuse, and eating disorders. From their synthesis, Dimidjian and colleagues concluded that specific third-wave treatments such as ACT, DBT, MBIs, and BA are supported by numerous RCTs, which, when combined, demonstrate a large within-groups effect size (i.e., pre-post symptom change), and a moderate between groups effect size (using mainly wait-list controls or treatment as usual as a comparison). Meta-analyses have also been performed comparing ACT to CBT, and these meta-analyses have reported no significant outcome differences between these treatments for anxiety disorders, general mental health conditions, and depressive symptoms (A-tjak et al., 2015; Bluett, Homan, Morrison, Levin, & Twohig, 2014; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Ruiz, 2012).

The efficacy of third-wave therapies for eating disorders is much less clear. Two meta-analyses of specific third-wave therapies have been conducted. First, Lenz, Taylor, Fleming, and Serman (2014) evaluated the effectiveness of DBT for BED and BN by calculating within- (pre-post change) and between-groups (comparing DBT to wait-lists or

² There is debate as to whether expanded versions of behavioral activation (BA) are considered a third-wave treatment (Hunot et al., 2013). For this review, BA studies were not included as a third-wave treatment as this treatment for eating disorders overlapped largely with the first-wave behavior therapy. Importantly, only one study to date (Alfonsson, Parling, & Ghaderi, 2015) has examined the efficacy of BA for eating disorders. Briefly, Alfonsson et al (2015) randomized participants with binge eating disorder to either a 10-week group BA treatment or to a wait-list control. The authors observed no significant differences between the two groups at post-treatment on binge eating days and on EDE-Q total scores. Exclusion of this study would therefore have negligible impact on our findings.

TAU conditions only) effect sizes for eating disorder behaviours. Large within-groups ($k=4$, $d=1.43$) and between-groups ($k=4$, $d=0.82$) effect sizes were observed, leading the authors to conclude that DBT is a potentially effective treatment for eating disorders. Second, Godfrey et al. (2015) reviewed studies that administered any form of MBI to treat binge eating in BED and non-clinical samples. Nine MBI studies, 6 DBT studies, and 4 ACT studies were included, and their meta-analysis was based on all interventions combined. Large ($g=1.12$) within-groups and moderate ($g=0.70$) between-groups effects favouring MBIs over wait-lists or TAU conditions were observed. Overall, these findings suggest that specific third-wave therapies such as DBT and MBIs are potentially effective treatments for BN and BED, at least in comparison to wait-list or TAU.

Despite the limited evidence of third-wave therapies for eating disorders, research has shown that clinicians are using third-wave techniques at least as often as they are using techniques derived from evidence-based therapies (CBT) to treat eating disorders. For example, Cowdrey and Waller (2015) found that the percentage of clients with eating disorders who reported that their therapist utilized mindfulness (77%) was typically larger than the percentage who reported their therapist used CBT-specific techniques such as food monitoring records (53%), weekly weighing (39%), and regular eating (82%). The use of third-wave therapies rather than empirically supported treatments raises concerns that those seeking treatment are not being provided with the most effective therapies. Therefore, a critical synthesis of the available literature on all third-wave eating disorder treatments studied to date is timely and pertinent.

This study therefore aims to examine the efficacy of third-wave therapies for eating disorders by (1) computing pre- to post-treatment and pre-treatment to follow-up effect sizes, and (2) comparing third-wave therapies to wait-lists, active controls, and empirically supported eating disorder treatments (i.e., CBT and IPT). Based on the available literature,

we aim to investigate whether each specific third-wave therapy meets the criteria required for an empirically-supported treatment for eating disorders proposed by Chambless and Hollon (1998). Chambless and Hollon (1998) differentiated between (a) *empirically-supported treatments that are specific in their mechanisms of action*, i.e., therapy outperforms a pill or alternative evidence-based treatment in multiple RCTs conducted by different research teams, (b) *efficacious therapies*, i.e., therapy outperforms no treatment in multiple RCTs conducted by different research teams, and (c) *possibly efficacious therapies*, i.e., therapy outperforms no treatment in one study or by more than one study conducted by the same team.

The original criteria for empirically-supported treatments proposed by Chambless and Hollon (1998) were selected over more recent criteria (e.g., proposed by Tolin, McKay, Forman, Klonsky, & Thombs, 2015). As newer criteria have been criticised (for a full commentary, see Chambless, 2015), and the Chambless and Hollon (1998) criteria are still the most commonly implemented in psychological treatment research (e.g., Steinert, Munder, Rabung, Hoyer, & Leichsenring, 2017), we used the original criteria for establishing the empirical status of the third-wave therapies.

Method

This review was conducted in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

Search Strategy

The primary search strategy involved searching four online databases: PsycINFO, Medline, CINAHL, and the Cochrane database. The final search was conducted in May 2017 by the first author (JL). Two sets of terms (i.e., eating disorder-related and third-wave therapy-related) were searched simultaneously using the “AND” Boolean operator (see

Supplementary Materials for the search strategy used). The reference list of included studies and relevant reviews were also searched.

Inclusion Criteria

Studies were included if they (a) administered a third-wave psychological intervention (see introduction), (b) to individuals with eating disorders, (c) who are over 16 years of age (c) either via a randomised controlled trial (RCT), clinical controlled trial, or prospective pre-post design, and (d) were published in English and in a peer-reviewed journal. Case studies or case series (i.e., only reported data for individual participants) were excluded. Due to the limited number of RCTs, non-randomised controlled trials and pre-post designs were included. This allows us to calculate both uncontrolled within-groups effect sizes and controlled between-groups effect sizes. Given the limitations of uncontrolled effect sizes (Cuijpers, Weitz, Cristea, & Twisk, 2016b), interpretations of the effects of third-wave therapies will be primarily based on controlled effect sizes and the qualitative synthesis.

Study Selection

After the search strategy outputs from the databases were combined, duplicate records were removed. Titles and abstracts were screened. The full text of articles indicating that a third-wave psychological intervention was delivered to individuals with eating disorders was read entirely to determine eligibility. Articles that met criteria were also screened to determine eligibility for meta-analysis. Authors were contacted by JL when studies did not provide enough data to calculate an effect size (Baer, Fischer, & Huss, 2005; Safer, Robinson, & Jo, 2010; Safer, Telch, & Agras, 2001). We were not able to obtain any additional data from these authors. Twenty-seven studies met full inclusion criteria. A flowchart of the search strategy, article selection, and the reasons for exclusion are presented in Supplementary Materials.

Quality Assessment

Study quality was evaluated using the Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project (EPHPP; Thomas, Ciliska, Dobbins, & Micucci, 2004). A rating of “strong”, “moderate” or “weak” was assigned for each of the following six domains: (1) selection bias, (2) study design, (3) confounders, (4) blinding, (5) data collection methods, and (6) withdrawals and drop outs. A global quality rating was then made based on the ratings from the six domains. As per recommendations, studies that received no “weak” domain ratings were rated as “strong” quality, while those with one “weak” rating were rated as “moderate” quality, and those with two or more “weak” ratings were rated as “weak” quality. Tables 1 and 2 in the provide domain and global ratings for each study. No studies were excluded on the basis of their quality rating. The first author (JL) conducted the quality ratings and consulted with the last author (LB) if clarification was required.

Meta-Analysis and Synthesis

Meta-analyses were performed at post-treatment and follow-up (i.e., the last reported follow-up). ITT data were prioritized over completer data for analyses. At times, multiple measures for a dependant variable were reported for a particular outcome. To avoid statistical dependence, we calculated effect sizes for each measure and then averaged them so that each study contributed to only one effect size per outcome (Lipsey & Wilson, 2001). Primary and secondary outcomes are as follows:

Primary outcomes.

1. ***Eating disorder psychopathology.*** The most global measure of eating disorder psychopathology reported from each study was selected for this analysis. Where available, the Eating Disorder Examination interview (EDE) or self-report questionnaire (EDE-Q) global score was prioritized and selected for this analysis (Fairburn & Beglin, 1994). Most outcomes selected for this analysis were the EDE

global scores ($k=18$), followed by the EDI Bulimia Subscale ($k=3$), the Binge Eating Scale score (BES; $k=2$), the EAT-Total score ($k=1$), and the Multifactorial Assessment of Eating Disorders Scale ($k=1$).

2. **EDE global score.** The global score from the EDE or the EDE-Q was analysed.
3. **Remission/recovery.** Remission/recovery rates varied, in that studies defined this variable as *either* (a) cessation from binge eating and/or purging over the past 28 days ($k=10$), (b) EDE global score within one standard deviation of community norms ($k=3$) (Fairburn & Beglin, 1994), or (c) not meeting diagnostic criteria (whatever the relevant DSM criteria were at the time of publication) for an eating disorder ($k=1$). All three definitions were aggregated in this analysis.
4. **Binge eating.** Defined as either the frequency of self-reported objective binge eating episodes over the past month or the number of objective binge eating days over the past month³.

Secondary outcomes.

1. **Shape concern, weight concern, eating concern, and dietary restraint.** These subscales from the EDE (or EDE-Q) were analysed separately.
2. **Depression scores.** Assessed either via the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the Montgomery-Asberg Depression Rating Scale (Montgomery & Asberg, 1979), the Symptom Checklist-90-Revised depression subscale (Derogatis, Rickels, & Rock, 1976), the Centre for Epidemiological Studies for Depression scale (Radloff, 1977), or the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).
3. **Self-esteem.** Assessed via the Rosenberg Self-Esteem Scale (Rosenberg, 1965).

³ While we intending on including purging as a primary outcome, this variable was operationalised too differently across studies, precluding a meaningful synthesis. For instance, it was assessed as the frequency of self-induced vomiting, the frequency of laxative misuse, and/or the frequency of compulsive exercise.

Effect size calculations. For within-groups analyses (pre-post change), the standardised mean difference (SMD) was calculated for continuous outcomes. Given that different scales were used to measure some of the outcomes selected for analysis (e.g., eating disorder psychopathology, depressive symptoms), we calculated the SMD instead of the raw mean difference. We then converted the SMD to Hedges g to correct for sample size (Lipsey & Wilson, 2001). Since the standard error is required to correct for sample size, the correlation between the pre-treatment and post-treatment (or follow-up) outcome is needed. As this correlation was never reported, we used the test-retest reliability of the relevant scale published in separate studies (Lipsey & Wilson, 2001) or used a conservative estimate of $r = .70$ if the reliability could not be obtained (Hofmann, Sawyer, Witt, & Oh, 2010; Linardon & Brennan, 2017). To calculate a pooled effect size, each study's overall effect size was weighted by its inverse variance (Lipsey & Wilson, 2001). A positive g indicates improvements from pre-treatment to post-treatment and follow-up. For dichotomous outcomes, the pooled event rate (i.e., the proportion that achieved remission) and 95% CI was calculated.

For between-groups (third-waves versus comparison), the SMD was also calculated for continuous outcomes and then converted to Hedge's g (Lipsey & Wilson, 2001). If means and standard deviations were not reported, the SMD was calculated using conversion equations (Borenstein, Hedges, Higgins, & Rothstein, 2009) for significance tests. Third-wave treatments were compared with (a) wait-list controls, (b) any active comparison, and (c) CBT⁴. If a study compared a third-wave treatment to two groups that fell within the same comparison type (i.e., two active psychological comparators), then the sample size of the third-wave treatment was halved to avoid double counting (Higgins & Green, 2011). A

⁴ None of the included studies delivered IPT as a comparison treatment.

positive g favours third-wave treatments over comparisons. A small (0.2), medium (0.5) and large (0.8) effect is specified. For dichotomous outcomes, the relative risk (RR) was calculated. The RR is the ratio of the probabilities of achieving remission between the two conditions. The RR was selected over the odds ratio because the odds ratio (a) is more complex to interpret, and (b) tends to overestimate an effect when the prevalence of an event is greater than 10%, (Schmidt & Kohlmann, 2008).

Heterogeneity and subgroup analyses. The Comprehensive Meta-Analysis program was used to calculate pooled effect sizes (Borenstein et al., 2009). As we expected considerable heterogeneity among the studies, a random effects model was used over a fixed effects models. In a random effects model, it is assumed that the included studies are drawn from “populations” of studies that differ from each other systematically. The effect sizes resulting from included studies in the random effects model not only differ because of the random error within studies (which the fixed effects model assumes), but also because of true variation in effect size from one study to the next (Borenstein et al., 2009). Heterogeneity was assessed through the I^2 statistic. The I^2 statistic assesses the degree of heterogeneity, where a value of 0% indicates no observed heterogeneity, 25% low heterogeneity, 50% moderate heterogeneity, and 75% as high heterogeneity (Higgins & Thompson, 2002).

Subgroup analyses were also conducted. Studies were grouped according to the type of third-wave therapy evaluated. For each subgroup, a pooled effect size is calculated, and a test is conducted to determine whether the subgroup effect sizes differ significantly from each other (Borenstein et al., 2009). The mixed effects model was used. Significant differences between subgroups are denoted by the Q_{between} statistic (Borenstein et al., 2009). Due to the small number of studies included in each meta-analysis, we did not test for publication bias.

Results

Study Characteristics

Table 1 and 2 present the characteristics of the RCTs and non-RCTs, respectively. In total, 15 used a transdiagnostic sample and nine a BED sample, two a BN sample, and one study sampled individuals with AN. Fourteen studies evaluated DBT, six evaluated MBIs, three evaluated CFT, two evaluated ACT, and two evaluated ST. In Table 3, we describe the underlying theoretical model of each of these third-wave therapies that have been tested in individuals with eating disorders. Thirteen studies were single treatment, pre-post designs, 13 were RCTs, and 1 was a non-randomised controlled trial.

The characteristics of the RCTs are as follows: five used a mixed transdiagnostic sample, five sampled BED, two sampled BN, and one sampled individuals with AN. Six RCTs administered a wait-list control while nine administered an active comparison⁵. Four RCTs administered CBT as a comparison – two evaluated self-help CBT program, and two evaluated therapist-led CBT. The other active comparisons were treatment as usual, diary card self-monitoring treatment, psychoeducation, and a non-specific supportive group therapy (see Table 1).

For the 13 RCTs, two received a strong quality rating, nine received a moderate quality rating, and two received a weak quality rating. The most common reason for these RCTs not receiving a strong overall quality rating ($k=11$) was because they were rated as “weak” on selection bias (i.e., they were either referred from a source in a systematic manner [e.g., a clinic] or self-referred to treatment rather than being “randomly selected from a comprehensive list of individuals in the target population; see Thomas et al., 2004). RCTs received generally positive quality ratings for all other domains, although some trials ($k=3$) did not control for significant baseline differences in post-treatment analyses.

⁵ Two studies used both a wait-list control and an active comparison treatment.

The quality of uncontrolled studies was similar to the RCTs. Two received a “strong” overall rating, nine received a “moderate” overall rating, and three received a “weak” overall rating. Selection bias was the domain that also most affected quality ratings (11 of 14 studies receiving a “weak” domain rating), for the same reasons specified earlier. All uncontrolled studies used valid and reliable assessment tools, and the majority (12/14) reported the number and reasons for dropout. Tables 1 and 2 present the quality ratings for RCTs and uncontrolled studies, respectively.

Meta-Analytic Findings

Table 4 presents the within and between-group results (for primary outcomes) of the meta-analyses of third-wave therapies. Although our intention was to conduct analyses separately for each eating disorder diagnosis, this was not feasible due to the limited number of included studies. Instead, analyses were conducted for the set of studies that sampled individuals with BED and then again for the set of studies that sampled *either* individuals with BN, AN, or transdiagnostic populations. The number of comparisons, pooled effect size, and degree of heterogeneity is provided in Table 4. The Supplementary Materials (Tables 3, 4, 5, and 6) present the results from the meta-analyses on all outcomes for each specific third-wave therapy.

Primary Outcomes

Third-wave therapies produced statistically significant, moderate-large improvements in primary outcomes (i.e., global symptoms, EDE global scores, remission, and binge eating) from pre-treatment to post-treatment and follow-up. These improvements occurred for studies that sampled BED and also for the studies that sampled either BN, AN, and transdiagnostic populations.

Third-wave therapies (in particular DBT) were consistently more efficacious (moderate effect sizes) than wait-list controls on primary outcomes. This effect occurred for

studies that sampled individuals with BED and also for studies that either sampled AN, BN, or transdiagnostic diagnoses. No statistically significant outcome differences (with small effect sizes) were observed between third-wave therapies and any active comparison generally, and CBT specifically, at post-treatment and follow-up, although a small number of studies were included in these analyses. Study quality did not moderate any observed effect sizes (see Supplementary Table 2).

Secondary Outcomes

Third-wave therapies produced statistically significant, moderate improvements on all secondary outcomes (i.e., EDE subscales, depression scores, and self-esteem) from pre-treatment to post-treatment and follow-up. No particular third-wave consistently produced the largest effect size (see Supplementary Materials).

Third-wave therapies were consistently more efficacious than wait-list controls (with small effect sizes). No statistically significant outcome differences were observed between third-wave therapies and active comparisons and CBT (see Supplementary Materials for results of the meta-analyses).

Qualitative Synthesis

A detailed qualitative synthesis for the available RCTs of third-wave therapies is now presented. Table 5 presents RCTs that have evaluated each third-wave therapy for eating disorders. Also noted is whether the third-wave therapy meets criteria for an empirically-supported treatment for eating disorder subgroups. The same is presented for CBT and IPT, which are established empirically-supported treatments.

Dialectical behaviour therapy. Seven RCTs of DBT have been conducted. Two RCTs evaluated DBT for individuals with BN, three RCTs evaluated DBT for individuals with BED, and two RCTs evaluated DBT for mixed samples.

DBT for BN. Both studies that have sampled individuals with BN compared therapist-led DBT to a wait-list control (Hill, Craighead, & Safer, 2011; Safer et al., 2001). Both studies were conducted by the same research team. In both studies, DBT was found to be statistically significantly more efficacious than the wait-list control at post-treatment in improving eating disorder behaviours (i.e., binge eating, purging) and eating disorder attitudes (i.e., EDE global scores). Follow-up comparisons were not performed, and both studies had relatively small sample sizes ($n=32$, and $n=29$, respectively).

DBT for BED. Two studies of DBT for BED compared DBT to a wait-list control (Masson, von Ranson, Wallace, & Safer, 2013; Telch, Agras, & Linehan, 2001). One study delivered a guided self-help version of DBT. In this study, those who received guided self-help DBT ($n=30$) reported significantly fewer binge eating episodes and lower EDE scores than participants who were assigned to the wait-list ($n=30$). These improvements were sustained at six month follow-up (Masson et al., 2013). The other study delivered therapist-led DBT to a small sample ($n=18$ completers for DBT and $n=16$ completers for wait-list) of individuals with BED (Telch et al., 2001). Abstinence from binge eating was significantly higher for those randomized to DBT ($n=18$; 89% abstinent) than those randomized to the wait-list ($n=16$; 12.5%), and those who received DBT reported significantly lower scores on the EDE weight, shape, and eating concern subscales. Abstinence rates at 6 month follow-up (56%) were considerably lower than the abstinence rates observed at post-treatment for those who received DBT.

The final study compared therapist-led DBT ($n=50$) for BED to a non-specific, active comparison group therapy ($n=51$) (Safer et al., 2010). Although the authors found that rates of binge eating abstinence occurred more quickly in those who were randomized to DBT (64%) compared to those randomized to the active comparison group (36%), these difference disappeared throughout the follow-up period (64% versus 36%, respectively). No post-

treatment differences were observed on any other measure of eating disorder psychopathology (e.g., EDE subscales), although moderate effect sizes favouring DBT were observed for dietary restraint and eating concern improvements at post-treatment and 12 month follow-up.

DBT for transdiagnostic samples. Two studies evaluated DBT in transdiagnostic samples. One study compared group-based DBT ($n=22$) to a diary card ($n=14$) self-monitoring condition (Klein, Skinner, & Hawley, 2013). DBT produced statistically significantly larger decreases in binge eating than the self-monitoring group, and significantly more individuals from the DBT condition moved from full- to subthreshold levels of binge eating. No follow-up analyses were performed. The second study implemented a stepped-care approach to BN and BED (Chen et al., 2016). In particular, all participants received four sessions of CBT guided self-help. After four weeks, participants were classed as rapid responders or slow responders (i.e., less than 65% reduction in binge eating or purging). While rapid responders continued with CBT guided self-help, slow responders were randomized to either 6 months of therapist-led DBT ($n=36$) or therapist-led CBT ($n=31$). Participants in both conditions received weekly treatment that combined group and individual therapy. For the CBT condition, the individual component was based on CBT-E (Fairburn, 2008) and the group program was based on the protocol reported by (Chen et al., 2003). Critically, a key component of CBT, the emotional eating module, was removed to differentiate the CBT intervention from the DBT intervention (given the emphasis of DBT on emotion regulation). Results at post-treatment showed that binge eating days (but not binge eating remission rates) was significantly higher for all slow responders (both CBT and DBT) relative to early responders who continued with guided self-help. The differences on binge eating days and EDE global scores between the modified-CBT and DBT slow responders were non-significant. There were no differences in remission rates and binge eating

frequencies between the three treatments at six (50% CBT guided self-help, 21% DBT, and 24% therapist-led modified-CBT) or 12 month (24% CBT guided self-help, 29% DBT, and 18% therapist-led modified-CBT) follow-up (Chen et al., 2016).

Schema therapy. Only one RCT of ST was conducted (McIntosh et al., 2016). This RCT compared therapist-led ST ($n=38$) to therapist-led CBT-BN ($n=38$) and appetite-focused CBT ($n=36$) in a transdiagnostic sample (McIntosh et al., 2016). The authors reported no statistically significant differences in primary (i.e., binge eating) or secondary (e.g., EDE global and subscales) outcomes between the three treatments at post-treatment or 12 month follow-up.

Compassion focused therapy. Two pilot RCTs of CFT have been conducted. Both RCTs were conducted by the same research team. One RCT compared guided self-help CFT ($n=15$) to a CBT self-help group ($n=13$) and wait-list control ($n=13$) in BED (Kelly & Carter, 2015b). While CFT and CBT self-help outperformed the wait-list control on binge eating reductions, CFT was associated with statistically significantly greater improvements in EDE global scores than the other two groups. In the second pilot RCT, group-based CFT ($n=11$) was compared with TAU ($n=11$) in a transdiagnostic sample. CFT significantly outperformed TAU at post-treatment on EDE global scores (Kelly, Wisniewski, Martin-Wagar, & Hoffman, 2016). No follow-up analyses were performed in either study.

Mindfulness-based interventions. Only one RCT of MBI has been conducted (Kristeller, Wolever, & Sheets, 2014). This RCT compared MBI ($n=50$) to a CBT psychoeducation group ($n=48$) and wait-list control ($n=42$) in individuals with BED. The authors found that while the MBI (31%) and CBT psychoeducation group (39%) produced greater rates of binge eating abstinence than the wait-list control (21%), this difference was not statistically significant. MBI and CBT psychoeducation did outperform the wait-list control group on continuous outcomes, including binge eating days and binge eating severity.

Acceptance and commitment therapy. To date, only one RCT of ACT for eating disorders has been conducted (Parling, Cernvall, Ramklint, Holmgren, & Ghaderi, 2016). In this study, individuals with AN were randomized to either a 19 session ACT-based intervention (n=24) or to a TAU condition (n=19). ITT analyses revealed that there were no statistically significant differences in rates of remission (i.e., defined as BMI \geq 19 and EDE-Q global score \leq 2.80) between those who received ACT and those who received TAU at post-treatment (28% for ACT, 11% for TAU) or at five year follow-up (56% for ACT and 36% TAU). The authors also reported no statistically significant differences between groups on additional outcomes (e.g., EDE global and subscale scores).

Discussion

This systematic review examined the empirical standing of the third-wave behaviour therapies for the treatment of eating disorders. Findings show that while third-wave therapies resulted in symptom improvements and were more efficacious than wait-list controls, third-wave therapies were general not superior to active psychological comparisons. Each third-wave therapy resulted in moderate to large improvements in eating disorder and general psychological symptoms from pre-treatment to post-treatment and follow-up in our meta-analyses. These findings are consistent with recent meta-analyses on the effects of specific psychological treatments for eating disorders, including DBT (Lenz et al., 2014), MBIs (Godfrey, Gallo, & Afari, 2015), and CBT (Linardon & Brennan, 2017; Linardon et al., 2017a; Linardon, Wade, De la Piedad Garcia, & Brennan, 2017b; Vocks et al., 2010), for eating disorders, and also on the effects of MBIs for disordered eating symptoms in non-clinical samples (Katterman, Kleinman, Hood, Nackers, & Corsica, 2014).

The above findings were based on the pre-post effect size. Pre-post effect sizes are based on uncontrolled studies, which means that it is impossible to know which portion of the

effect size is caused by the therapy and which by other extraneous variables, including spontaneous recovery, passage of time, and regression to the mean (Cuijpers et al., 2016b). RCTs are necessary to establish treatment efficacy, since this is the only way improvements can be attributed to the specific intervention (Kazdin, 2007).

Therefore, we also calculated between-group effect sizes based on the available RCTs. We found third-wave therapies to be consistently more efficacious than wait-list controls (with small effect sizes), which is consistent with a previous meta-analysis documenting the superiority of third-wave therapies over wait-list controls for a range of clinical conditions (Öst, 2008). Third-wave therapies were not, however, significantly superior to a combination of active comparisons (e.g., usual care, non-specific group therapy), or to CBT specifically, across any eating disorder subgroups.

An important aim of this study was to evaluate the empirical standing of each specific third-wave therapy for eating disorders, based on establish criteria (Chambless & Hollon, 1998). Table 5 presents the empirical standing of each specific third-wave therapy. Below we discuss the empirical standing of each third-wave therapy for individuals with eating disorders.

Empirical Support for Third-Wave Therapies

Dialectical behaviour therapy. DBT for eating disorders is the most widely studied third-wave therapy. Seven RCTs have been published — two with BN samples, three with BED samples, and two on transdiagnostic samples. Although DBT for BN was shown to outperform wait-list controls at post-treatment, both RCTs were conducted by the same research team, and neither trial reported follow-up data. Therefore, DBT is a *possibly efficacious* treatment for BN. Replication by a different research team is required before concluding that DBT is efficacious for BN. Regarding BED, two studies, conducted by different research teams, found DBT for BED to outperform wait-list controls. However, one

study administered full, therapist-led DBT whereas the other delivered an abbreviated guided self-help DBT. The former study also had sample size ($n=18$ for DBT and $n=16$ for wait-list) smaller than the recommendations (i.e., at least 25 in each group) proposed by Chambless and Hollon (1998). An additional larger sample RCT comparing therapist-led DBT for BED to a wait-list control showing similar results is required to establish whether DBT is an efficacious treatment for BED. In addition, another study that compared DBT for BED to an active comparison did not observe any post-treatment or follow-up differences on several eating disorder-related outcomes. Based on these findings, DBT for BED is a *possibly efficacious* treatment for BED.

Schema therapy. ST has only been investigated in RCT in a transdiagnostic sample. Until more trials of ST are conducted, ST can only be considered a *possibly efficacious treatment* for bulimic-type disorders, as ST performed equally well to CBT in this trial.

Compassion-focused therapy. Two pilot RCTs of CFT have been conducted, one on individuals with BED and the other on a transdiagnostic sample. Both studies were conducted by the same research team. Although CFT seems to be a promising treatment for transdiagnostic binge eating-related disorders, larger trials conducted by different research teams are needed. Until then, CFT is a *possibly efficacious* for the treatment of binge eating.

Mindfulness-based interventions. One RCT has investigated MBI for BED. Therefore, replication by other research teams is required. MBIs are *possibly efficacious* for the treatment of BED.

Acceptance and commitment therapy. ACT has only been investigated in one RCT. ACT did not outperform TAU at post-treatment or five year follow-up in individuals with AN. ACT is therefore currently *not an efficacious treatment* for any eating disorder.

Comparison to Empirically-Supported Treatments

CBT is an empirically-supported treatment for a range of eating disorder presentations, and IPT has strong empirical support for BN and BED. CBT has been evaluated in numerous RCTs, and has consistently outperformed inactive, active, and pharmacological comparisons in BN, BED, and related disorders. In addition, meta-analyses have also documented the efficacy of CBT for BN and BED over inactive and active psychological controls, with large and small effect sizes, respectively (Brownley et al., 2016; Cuijpers, Donker, Weissman, Ravitz, & Cristea, 2016a; Linardon et al., 2017a, 2017b). IPT has also been investigated in several RCTs, and has been shown to be superior to wait-lists in BED (Wilfley et al., 1993) and behavioural weight loss in BED (Wilson, Wilfley, Agras, & Bryson, 2010), and not statistically different to CBT for BN at long-term follow-up (Agras et al., 2000; Fairburn, Jones, Peveler, Hope, & O'Connor, 1993).

Clinical, Practical and Research Implications

To date, there is little research examining the efficacy of specific third-wave therapies for individuals with eating disorders. Although a number of third-wave therapies are “possible efficacious” treatments for BN and BED, none of these meet criteria for an empirically supported treatment. Despite this, there is some evidence suggesting that clinician-based practitioners are increasingly beginning to implement third-wave therapies to their clients with eating disorders (Cowdrey & Waller, 2015), suggesting that such clients are not receiving a psychological treatment which has known empirical support.

In order to provide the best possible service to clients, it is important that clinicians and researchers work together to build on the evidence and test the efficacy and effectiveness of these treatments. For example, practitioners delivering third-wave therapies could help establish their initial efficacy through controlled single case experimental designs. These designs are feasible for clinicians to conduct, are clinically relevant, and require only one or a few participants (Kazdin, 2011). Results of a single case designs can then provide

foundational evidence for researchers who plan to investigate this treatment through an expensive RCT, and also for agencies who are deciding on whether to fund such as trial. Working collaboratively in such a manner is critical for evaluating the efficacy/effectiveness of third-wave therapies for eating disorders.

Based on the available data, CBT shows the strongest empirical support, with IPT also being an efficacious treatment for certain eating disorder subgroups. Such empirically supported treatments should therefore be the first-line treatments delivered by clinicians. However, there is evidence to suggest that empirically supported treatments for eating disorders are not routinely and/or competent delivered in clinical practice (see Kazdin, Fitzsimmons-Craft, & Wilfley, 2017; Shafran et al., 2009). Barriers to the dissemination and implementation of empirically supported eating disorder treatments typically include the beliefs about the applicability of research findings to “real world” settings, lack of clinical training and supervision, lack of knowledge about the mechanisms that are responsible for therapeutic change, and the minimum required dose of therapy (Kazdin et al., 2017; Waller, 2009). Because of this, a great deal of research, with emerging success, has begun to focus on and test (a) novel and scalable approaches to clinical training (Cooper et al., in press; Fairburn, Allen, Bailey-Straebler, O'Connor, & Cooper, 2017), (b) the mechanisms of therapeutic change (Linardon, Brennan, & de la Piedad Garcia, 2016; Linardon, de la Piedad Garcia, & Brennan, 2016), and (c) the amount of treatment required for it to be effective (Rose & Waller, 2017). In addition to expanding the evidence base of third-wave therapies, continued efforts toward correcting these barriers to the implementation and dissemination of empirically supported eating disorder treatments is required for ensuring the clients are receiving the best possible care.

Limitations

Limitations to the current review must be considered. A large degree of heterogeneity was present across most analyses. This was likely due to variations in study characteristics. It is not uncommon for statistical heterogeneity to be high in meta-analyses, particularly when calculating within-group effects (Cuijpers et al., 2016b), though caution in interpretations is required when heterogeneity cannot be explained. A related limitation was that our meta-analyses were based on the combining of different eating disorder presentations (i.e., BN, AN, and mixed samples). Notably, certain eating disorder presentations may have distinct features. For example, emotion regulation deficits are considered a transdiagnostic feature, yet such deficits may be expressed differently in individuals with BN (e.g., binge/purge behavior; Goldschmidt et al., 2014) and AN (e.g., self-starvation; Brockmeyer et al., 2012). This might have thus contributed to the high degree of heterogeneity. It is important to note, however, that our conclusions were primarily based on our qualitative synthesis, which examined the empirical status of third-wave therapies for each specific eating disorder presentation. In addition, for practical reasons, peer-reviewed journals published in English were only included. Thus, unpublished studies and non-English might have not have been identified. As unpublished studies are more likely to report null findings, it might be that our effect sizes were inflated (Rosenthal, 1991). The limited number of studies contributing to our analyses also prevented an analysis of publication bias.

Conclusion

This study was the first to evaluate the empirical standing of third-wave therapies for the treatment of eating disorders, by both qualitatively synthesising the available findings of third-wave therapies in RCTs and quantitatively estimating the size of these treatment effects. Although there is promising preliminary evidence of the potential efficacy of specific third-wave therapies for certain eating disorders, no third-wave therapy currently meets formal criteria for an EST. Overall, CBT retains its status as the treatment of choice for BN, BED

and the front-running treatment for adults with AN, with IPT also considered a strong empirically-supported alternative for BN and BED.

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Table 1
Characteristics of included randomized controlled trials

Publication	Sample	Third-wave treatment (n)	Comparison (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings	
							Selection bias	Design	Confounders	Blinding	Data collection	Drop-out	Global		
Chen et al. (2016)	Trans	DBT (n=36)	CBT (n=31)	Binge eating days; EDE global; Remission from B/P b/p;	EOT 12 months	ITT	W	S	S	M	S	M	M	At post-treatment, for slow responders, no significant differences on measures of eating disorder psychopathology were observed between those assigned to DBT and those assigned to CBT. No differences were also observed at follow-up.	
Courbasson, et al. (2012)	Trans	DBT (n= 15)	TAU (n=10)	Binge eating episodes; EDE global; Shape concern; Weight concern; Dietary restraint;	EOT 6 months	Comp	W	S	NA	M	S	M	M	Between groups comparisons were not performed by authors given the small sample size in each group. The authors did observe large pre-post improvements in binge eating and EDE global and subscale scores ($d's = 0.81 - 1.60$).	
Hill et al (2011)	BN	DBT (n=18)	Wait-list (n= 14)	Binge eating episodes; Remission from B/P; EDE global; Shape concern; Weight concern; Dietary restraint; Depression	EOT	ITT	W	S	M	M	S	M	M	Participants randomized to DBT reported significantly fewer binge eating episodes and significantly lower levels of EDE global and subscale scores at post-treatment, compared to participants assigned to a wait-list control.	
Kelly et al (2015)	BED	CFT (n= 15)	CBT (n= 13) Wait-list (n= 13)	Binge eating episodes; EDE global Depression	EOT	ITT	W	S	S	M	S	M	M	Participants randomized to the two active treatment conditions (CFT and CBT self-help) reported significantly fewer OBE days than participants randomized to the wait-list. CFT led to greater reductions in EDE global scores than the wait-list and the CBT group.	

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Characteristics of included randomized controlled trials

Publication	Sample	Third-wave treatment (n)	Comparison (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings	
							Selection bias	Design	Confounders	Blinding	Data collection	Drop-out	Global		
Kelly et al (2016)	Trans	CFT (n=11)	TAU (n=11)	EDE global	EOT	ITT	W	S	S	M	S	S	M	Compared to the TAU group, the authors reported that those who received CFT reported significantly lower post-treatment EDE global scores.	
Klein et al (2013)	Trans	DBT (n=22)	Dairy card group (n= 14)	Binge eating episodes; EDI bulimia subscale	EOT	Comp	W	S	S	M	S	S	M	While those randomized to DBT and the self-monitoring diary card group reported large reductions in binge eating and purging, decreases were significantly greater in those randomized to DBT.	
Kristeller et al (2014)	BED	MBI (n=50)	CBT psychoeducation (n=48) Wait-list (n= 42)	Binge eating frequency; Binge eating scale ; Remission from B Self-esteem; Depression	EOT 4 months	ITT	W	S	W	M	S	M	M	No significant differences between binge eating abstinence were observed between the three groups at post-treatment. MBI and psychoeducation did outperform the wait-list on binge eating days and binge eating severity and post-treatment and follow-up.	
Masson et al (2013)	BED	DBT (n= 30)	Wait-list control (n= 30)	Binge eating frequency; EDE global; Remission from B; Weight concern; Shape concern; Dietary restrain	EOT 6 months	ITT	W	S	W	M	S	M	W	At post-treatment, DBT participants reported significantly fewer past-month binge eating episodes and EDE global scores than WL participants, and significantly greater rates of abstinence from binge eating (40.0% versus 3.3%). Improvements in DBT were sustained at 6 months follow-up.	
McIntosh et al (2016)	Trans	ST (n=38)	CBT appetite-focused	Binge eating frequency; EDE global; EDE global within norms; EDE	EOT 12 months	Comp	M	S	S	M	S	M	S	The authors observed no significant differences between the three treatments on any dichotomous (i.e., remission) and continuous (i.e., EDE global and subscales,	

Table 1

Characteristics of included randomized controlled trials

Publication	Sample	Third-wave treatment (n)	Comparison (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings	
							Selection bias	Design	Confounders	Blinding	Data collection	Drop-out	Global		
			therapy (n=36)	within norms; Weight concern; Shape concern; Dietary restraint; Depression										binge eating frequency) outcomes at post-treatment and follow-up periods.	
Parling et al (2016)	AN	ACT (n= 24)	CBT-BN (n=38) TAU (n=19)	EDE global; Recovery; Eating concern; Weight concern; Shape concern; Dietary restraint; Depression; Self-esteem	EOT 5 years	ITT	M	S	S	M	S	M	S	The authors reported no statistically significant differences at any time point for those who were randomized to ACT to those who were randomized to AU on measures of “good outcome” (i.e., BMI and EDE global scores) and on the continuous outcomes.	
Safer et al (2010)	BED	DBT (n= 50)	ACGT (n=51)	EDE global; Remission from B; Weight concern; Shape concern; Dietary restraint; Depression; Self-esteem	EOT 12 months	ITT	W	S	W	M	S	M	W	Abstinence occurred more quickly in those who were randomized to DBT (64%) compared to those randomized to the active comparison group (36%). However, these difference disappeared throughout the follow-up period (64% versus 36%, respectively). No statistically significant group differences were observed on several continuous outcome measures (e.g., EDE subscales).	
Safer et al (2001)	BN	DBT (n= 14)	Wait-list (n=15)	Remission from B/P; Depression; Self-esteem	EOT	ITT	W	S	S	M	S	S	M	DBT was found to be statistically significantly more efficacious than the wait-list control at post-treatment in improving eating disorder behaviours (i.e., binge eating, purging) and eating disorder attitudes (i.e., EDE global scores).	

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Characteristics of included randomized controlled trials

Publication	Sample	Third-wave treatment (n)	Comparison (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings
							Selection bias	Design	Confounders	Blinding	Data collection	Drop-out	Global	
Telch et al (2001)	BED	DBT (n=22)	Wait-list (n=22)	EDE global ; Remission from B; Weight concern; Shape concern; Dietary restraint; Depression; Self-esteem	EOT	Comp	W	S	NA	M	S	M	M	DBT significantly outperformed the wait-list on abstinence rates, binge eating frequency, and eating, weight, and shape concerns.

Note: BN= bulimia nervosa; BED= binge eating disorder; Trans= transdiagnostic; DBT= dialectical behaviour therapy; MBI= mindfulness-based intervention; ST= schema therapy; CFT= compassion focused therapy; ACT= acceptance and commitment therapy; TAU= treatment as usual; EOT= end of treatment; ITT= intention to treatment; B= Binge' B/P= Binge/purge
W= weak; M= moderate; S= strong; Note, the following refer to the criteria outlined by the Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project; (1) selection bias, (2) study design, (3) confounders, (4) blinding, (5) data collection methods, and (6) withdrawals and drop outs; G= global score, calculated by no “weak” domain ratings were rated as “strong” quality, while those with one “weak” rating were rated as “moderate” quality, and those with two or more “weak” ratings were rated as “weak” quality.

Table 2
Characteristics of included uncontrolled studies

Publication	Sample	Third-wave treatment (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings	
						Selection bias	Design	Confounders	Blinding	Data collection	Drop-out	Global		
Baer et al. (2005)	BED	MBI (n= 10)	None (insufficient data reported)	EOT	Comp	W	M	NA	NA	S	M	M	Pre-post improvements were observed on binge eating frequency and EDE subscale scores. The greatest improvement was observed for eating concerns (d= 2.90).	

Table 2
Characteristics of included uncontrolled studies

Publication	Sample	Third-wave treatment (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings
						Selecti on bias	Design	Confou nders	Blindin g	Data collecti on	Drop- out	Global	
Ben-Porath et al. (2014)	Trans	DBT (n= 65)	Binge eating episodes' EDE global; Shape concern; Weight concern; Dietary restraint	EOT	Comp	W	M	NA	M	S	W	W	Paired-samples T tests showed that significant pre-post improvements were observed for binge eating and purge frequencies, and EDE global, restraint, weight and eating concerns. Effect sizes were moderate (d's 0.39-0.74).
Ben-Porath et al. (2009)	Trans	DBT (n= 40)	EDE global; Depression	EOT	Comp	W	M	NA	NA	S	S	M	Significant and modest pre-post improvements were observed on EDE-Q global scores. The improvements observed did not differ for those who had a comorbid personality disorder.
Chen et al. (2008).	Trans	DBT (n= 8)	Binge eating episodes EDE global; Abstinence from B/P	EOT 6 months	Comp	W	M	NA	M	S	M	M	From pre- to post-treatment, effect sizes for objective binge eating, total EDE scores and global adjustment were large. .From pre- to 6-months follow-up, effect sizes were large for all these outcomes
Courbasson et al (2011)	BED	MBI (n=38)	Binge eating episodes; EDE global; Shape concern; Weight concern; Dietary restraint;; Depression	EOT	Comp	M	M	NA	M	S	M	S	Participants improved significantly from pre to post-treatment on binge eating frequencies and EDE-Q global and subscale scores. The effect sizes were large (<i>d's</i> = 0.86 – 2.87).
Gale et al. (2014).	Trans	CFT (n= 139)	Binge eating episodes; Recovered EDE global; Shape concern; Weight	EOT	Comp	W	M	NA	M	S	S	M	There were significant improvements on outcome measures. Individuals with bulimia nervosa improved significantly more than individuals with anorexia nervosa on most outcomes. Also, 73% of those with

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Characteristics of included uncontrolled studies

Publication	Sample	Third-wave treatment (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating						Brief Summary of Findings	
						Selecti on bias	Design	Confou nders	Blindin g	Data collecti on	Drop- out		
			concern; Dietary restraint										bulimia nervosa were considered to have made clinically reliable and significant improvements at the end of treatment (compared with 21% of people with anorexia nervosa and 30% of people with OSFEDs)
Hepworth (2011)	Trans	MBI (n=33)	EAT-26	EOT	Comp	M	M	NA	W	S	S	M	Significant and moderate (eta squared = 0.63) pre-post improvements were made on the EAT-26 scores. There were no differences in the observed improvements across diagnoses.
Juarascio et al. (2013)	Trans	ACT (n= 66)	EDE global; Recovery (EDE norms); Weight concern Shape concern; Dietary restraint	EOT	Comp	W	M	S	W	S	M	W	This non-randomized trial demonstrated that while improvements in EDE subscale scores were greater in those who received ACT relative to those who received TAU, these differences did not reach statistical significance. ACT participants were significantly more likely to fall in normative EDE ranges, however.
Klein et al (2012)	Trans	DBT (n=10)	Binge eating episodes; EDI bulimia subscale; Abstinence from B/P	EOT	Comp	W	M	NA	M	S	W	W	Large pre-post improvements in binge eating ($d= 2.45$), were observed. No significant improvements were observed on other outcomes, including drive for thinness and body dissatisfaction.
Kristella et al (1999)	BED	MBI (n=18)	Binge eating frequency; Binge eating scale	EOT	Comp	W	M	NA	M	S	S	M	Significant and large improvements from pre-treatment to post-treatment were observed for binge eating frequencies, eating control, and binge eating scale.

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Characteristics of included uncontrolled studies

Publication	Sample	Third-wave treatment (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating							Brief Summary of Findings
						Selecti on bias	Design	Confou nders	Blindin g	Data collecti on	Drop- out	Global	
Kröger et al. (2010)	Trans	DBT (n= 24)	Binge eating frequency; EDI composite score	EOT 15 months	ITT	M	M	S	M	S	M	S	Recovery rates were 38% for AN and 54% for BN who received DBT. Moderate to large effect sizes were observed for binge eating improvements from pre-treatment to post-treatment ($d's = 0.82 - 2.80$) and from pre-treatment to follow-up ($d's = 0.77 - 2.40$). Outcomes did not differ as function of diagnosis.
Simpson et al (2010)	Trans	ST (n= 8)	EDE global; Depression	EOT 6 months	Comp	W	M	NA	M	S	S	M	Clinically significant improvement in eating severity was found in four out of six participants who completed schema therapy. Significant pre-post and pre-follow up improvements on EDE-Q global scores were also observed.
Telch et al (2000)	BED	DBT (n= 11)	EDE global; Remission from B Weight concern; Shape concern Dietary restraint; Depression Self-esteem	EOT	Comp	W	M	W	M	S	S	M	Binge episodes and binge days decreased from baseline to posttreatment. Nine of the 11 participants reported no binge eating over the prior 4 weeks at the end of treatment. Large improvements on eating, shape, and weight concerns were also observed ($d's = 1.1-1.3$)
Woolhouse et al (2012)	Trans	MBI (n=33)	MAEDS scores	EOT 3 months	Comp	W	M	NA	M	S	M	M	Significant pre-post and pre follow-up improvements were observed on measures of eating disorder psychopathology, eating self-efficacy, binge eating, and body image concerns.

Note: BN= bulimia nervosa; BED= binge eating disorder; Trans= transdiagnostic; DBT= dialectical behavior therapy; MBI= mindfulness-based intervention; ST= schema therapy; CFT= compassion focused therapy; ACT= acceptance and commitment therapy; TAU= treatment as usual; EOT= end of treatment; ITT= intention to treatment; MAEDS= Multifactorial Assessment of Eating Disorders

Table 2

Characteristics of included uncontrolled studies

Publication	Sample	Third-wave treatment (n)	Outcomes included in meta-analysis	Time-points	Analysis	Domain and global quality rating						Brief Summary of Findings	
						Selecti on bias	Design	Confou nders	Blindin g	Data collecti on	Drop- out	Global	

Scale; B= Binge' B/P = Binge/purge; W= weak; M= moderate; S= strong; Note, the following refer to the criteria outlined by the Quality Assessment Tool for Quantitative Studies developed by the Effective Public Health Practice Project; (1) selection bias, (2) study design, (3) confounders, (4) blinding, (5) data collection methods, and (6) withdrawals and drop outs; G= global score, calculated by no "weak" domain ratings were rated as "strong" quality, while those with one "weak" rating were rated as "moderate" quality, and those with two or more "weak" ratings were rated as "weak" quality.

Table 3

A description of each third-wave therapy for the treatment of eating disorders

Therapy	Description of treatment and underlying model
Dialectical behavioural therapy	According to the DBT model, deficits in emotion regulation are at the core of eating disorder symptoms (Telch et al., 2001). Difficulties in regulating emotions are assumed to be a major trigger of bulimic behaviours. Bulimic behaviours also provide temporary relief from negative affect, meaning that they become a conditioned response that are negatively reinforced (Safer et al., 2001). Thus, DBT specifically targets these deficits in emotion regulation by teaching a broad spectrum of skills (e.g., mindfulness, distress tolerance, interpersonal effectiveness) aimed at enhancing an individual's emotion regulation capabilities (Telch et al., 2001)
Schema therapy	ST was developed based on the relationship between early life experiences and the development and maintenance of disordered eating (Simpson, Morrow, van Vreeswijk, & Reid, 2010). ST assumes that negative early life experiences result in maladaptive schemas (stable and enduring emotions, cognitions, and bodily experiences that guide information processing) which in turn lead to eating disorder symptoms. Given that maladaptive schemas are central to the maintenance of eating disorder symptoms, ST helps the client identify and become aware of these schemas. Considerable effort is then devoted toward modifying, challenging, and changing the function of these schemas, with the assumption that this will then reduce eating disordered symptoms (McIntosh et al., 2016).
Compassion focused therapy	The CFT model recognises the self-critical nature and shame experienced by individuals with eating disorders (Gale, Gilbert, Read, & Goss, 2014). These tendencies generate a range of negative experiences, including hostility, anger, and threatened. Eating disorder behaviours (i.e., restriction, binge eating) are assumed to arise from this self-criticism and shame, and because CFT assumes that there is some sort of fear driving this self-criticism and shame, treatment is devoted toward identifying the function of these fears and developing compassion (i.e., responding to them with courage and sensitivity) for them (Kelly & Carter, 2015a)

Mindfulness-based interventions	A core focus of MBI is to attempt to increase a focused, purposeful awareness of the present moment and relating to one's experiences in an open, non-judgemental manner (Kristeller et al., 2014). Meditation, body scans, and mindfulness exercises are utilised. Present moment awareness is one of the purported mechanisms of action. Here, individuals are encouraged to relate to one's thoughts merely as events passing by, rather than taking their literal meaning (e.g., also known as decentering). Decentering allows individuals to interpret thoughts and feelings in a non-judgemental fashion without the need to resort to avoidance or escape-related (e.g., purging) behaviours (Hayes et al., 2011).
Acceptance and commitment therapy	Improving psychological flexibility (i.e., being mindfully aware and accepting an internal experience in the present moment) is a key focus of ACT-based treatments (Hayes, 2004). Individuals are taught to clarify their values and are encouraged to engage in behaviours that are consistent with these values. Since there are various disordered eating-related triggers (e.g., mood fluctuations, interpersonal conflict), ACT also aims to help individuals create a different relationship with these triggers (i.e., accepting them as passing moments) rather than acting on or avoiding them (Juarascio et al., 2013).

Table 4:
Within and between-groups effect sizes for primary outcomes

Outcomes	Analysis	BN, AN, and Transdiagnostic Samples				Binge Eating Disorder Samples			
		N _{comp}	ES (95% CI)	I ²	Qbp	N _{comp}	ES (95% CI)	I ²	Qbp
ED psychopathology (g)	Pre-post (all third-wave)	17	1.07 (0.85, 1.28)*	81.89*	No diff (p=.980)	8	1.18 (0.92, 1.44)*	72.41*	No diff (p=.380)
	DBT	9	1.15 (0.78, 1.55) *			4	1.01 (0.62, 1.40)*		
	ACT	2	1.09 (0.36, 1.83)*			-	-		
	ST	2	0.87 (0.11, 1.61)*			-	-		
	MBI	2	0.96 (0.23, 1.69)*			3	1.43 (0.97, 1.90)*		
	CFT	2	1.04 (0.29, 1.79)*			1	1.14 (0.31, 1.98)*		
	Pre-follow-up	8	0.92 (0.64, 1.20)*	75.52*	ST > DBT, ACT, MBI (p<.001)	3	1.38 (1.01, 1.74)*	73.61*	MBI > DBT (p=.006)
	DBT	4	0.71 (0.55, 0.89)*			2	1.19 (0.97, 1.42)*		
	ACT	1	0.57 (0.25, 0.89)*			-	-		
	ST	2	1.82 (1.41, 2.23)*			-	-		
	MBI	1	0.89 (0.55, 1.99)*			1	1.76 (1.42, 2.11)*		

Table 4:
Within and between-groups effect sizes for primary outcomes

		BN, AN, and Transdiagnostic Samples				Binge Eating Disorder Samples			
Outcomes	Analysis	N _{comp}	ES (95% CI)	I ²	Qbp	N _{comp}	ES (95% CI)	I ²	Qbp
Remission (event rate & RR)	Third-wave vs WL (EOT)	2	1.13 (0.61, 1.66)*	0.00		3	0.92 (0.60, 1.25)*	0.00	
	Third-wave vs WL (FU)	-	-	-		2	1.34 (0.87, 1.82)*	0.00	
	Third-wave vs active (EOT)	5	0.28 (-0.19, 0.75)	66.37*		3	0.49 (0.21, 0.78)*	0.00	
	Third-wave vs active (FU)	3	-0.09, (-0.39, 0.21)	2.03		2	0.51 (0.19, 0.83)*		
	Third-wave vs CBT (EOT)	2	-0.08 (-0.41, 0.24)	0.00		2	0.52 (-0.11, 1.16)		
	Third-wave vs CBT (FU)	2	-0.38 (-0.47, 0.39)	35.34*		1	0.31 (-0.16, 0.79)	-	
	Pre-post	10	0.39 (0.32, 0.46)*	29.64		4	0.69 (0.45, 0.86)	77.78*	
	DBT	5	0.37 (0.28, 0.47)*			4	0.69 (0.45, 0.86)		
	ACT	2	0.31 (0.22, 0.41)*			-	-		
	ST	1	0.61 (0.44, 0.74)*			-	-		
	MBI	1	0.41 (0.24, 0.61)			-	-		
	CFT	1	0.39 (0.30, 0.41)*			-	-		
					ST > DBT, ACT, MBI, CFT (p=.049)				N/A
	Pre follow-up	4	0.45 (0.26, 0.65)	69.63*		4	0.67 (0.38 0.87)	83.57*	
	DBT	2	0.31 (0.12, 0.61)			4	0.67 (0.38 0.87)		
	ACT	1	0.56 (0.9, 0.87)			-	-		
	ST	1	0.58 (0.24, 0.86)			-	-		
					No diff (p=.442)				
EDE global (g)	Third-wave vs WL (EOT)	1	9.60 (0.56, 163.58)	-		3	3.82 (1.22, 11.95)	56.10*	
	Third-wave vs active (EOT)	5	0.92 (0.72, 1.18)	0.00		2	1.22 (0.49, 3.05)	78.80*	
	Third-wave vs active (FU)	4	1.09 (0.65, 1.82)	0.00		1	1.34 (0.61, 3.00)		
	Third-wave vs CBT (EOT)	3	0.91 (0.71, 1.15)	0.00		1	0.71 (0.29, 1.69)	-	
	Third-wave vs CBT (FU)	3	0.87 (0.65, 1.15)	0.00		-	-	-	
	Pre-post	12	1.09 (0.78, 1.40)*	87.78*		6	0.98 (0.83, 1.13)*	0.00	
	DBT	6	1.20 (0.67, 1.77)*			4	1.02 (0.85, 1.20)*		
	ACT	2	1.10 (0.17, 2.02)*			-	-		
	ST	2	0.86 (-0.09, 1.80)			-	-		
	CFT	2	1.04 (0.11, 1.97)*			1	1.13 (0.65, 1.62)*		

Table 4:
Within and between-groups effect sizes for primary outcomes

		BN, AN, and Transdiagnostic Samples				Binge Eating Disorder Samples			
Outcomes	Analysis	N _{comp}	ES (95% CI)	I ²	Qbp	N _{comp}	ES (95% CI)	I ²	Qbp
Binge eating (g)	MBI	-	-		No diff (p=.931)	1	0.79 (0.47, 1.11)*		No diff (p=.366)
	Pre follow-up	5	1.05 (0.54, 1.55)*	84.85*		2	1.19 (0.97, 1.41)*	0.00	
	DBT	2	0.71 (0.45, 0.96)*			2	1.19 (0.97, 1.41)*		
	ACT	1	0.57 (0.24, 0.89)*			-	-		
	ST	2	1.82 (1.41, 2.23)*		ST > DBT, ACT (p<.001)	-	-		NA
	Third-wave vs WL (EOT)	1	0.91 (0.19, 1.62)*	-		3	0.81 (0.44, 1.18)*	0.00	
	Third-wave vs active (EOT)	5	0.22 (-0.23, 0.68)	67.33*		2	0.62 (0.26, 0.98)*	0.00	
	Third-wave vs active (FU)	4	0.92 (0.71, 1.21)	0.00		1	1.12 (0.82, 1.54)	-	
	Third-wave vs CBT (EOT)	3	-0.17 (-0.31, 0.28)	0.00		1	1.01 (0.14, 1.89)*	-	
	Third-wave vs CBT (FU)	3	-0.03 (-0.35, 0.28)	0.00		-	-		
	Pre-post	10	0.81 (0.57, 1.04)*	72.74*		7	1.38 (0.92, 1.86)*	87.54*	
	DBT	8	0.84 (0.61, 1.08)*			3	0.93 (0.63, 1.23)*		
	ST	1	1.02 (0.48, 1.55)*			-	-		
	CFT	1	0.34 (-0.13, 0.82)			1	0.84 (0.29, 1.39)*		
	MBI	-	-		No diff (p=.125)	3	2.04 (1.70, 2.37)*		MBI > DBT, CFT (p<.001)
	Pre follow-up	4	1.05 (0.83, 1.27)*	0.00		2	1.35 (0.07, 2.61)*	96.44*	
	DBT	3	0.99 (0.72, 1.27)*			1	0.71 (-3.74, 5.17)		
	ST	1	1.15 (0.79, 1.51)*			-	-		
	MBI	-	-		No diff (p=.507)	1	2.00 (-2.45, 6.45)		No diff (p=.687)
	Third-wave vs WL (EOT)	2	0.93 (0.41, 1.45)*	0.00		4	0.89 (0.59, 1.19)*	0.00	
	Third-wave vs WL (FU)	-	-	-		1	0.94 (0.43, 1.45)*	-	
	Third-wave vs active (EOT)	4	0.25 (-0.14, 0.66)	43.94		2	-0.02 (-0.43, 0.39)	0.00	
	Third-wave vs active (FU)	3	0.13 (-0.19, 0.45)	0.00		1	0.24 (-0.24, 0.72)	-	
	Third-wave vs CBT (EOT)	3	0.09 (-0.20, 0.39)	0.00		2	-0.02 (-0.43, 0.39)	0.00	

Table 4:
Within and between-groups effect sizes for primary outcomes

BN, AN, and Transdiagnostic Samples						Binge Eating Disorder Samples			
Outcomes	Analysis	N _{comp}	ES (95% CI)	I ²	Qbp	N _{comp}	ES (95% CI)	I ²	Qbp
	Third-wave vs CBT FU)	3	0.13 (-0.19, 0.45)	0.00		1	0.24 (-0.24, 0.72)	-	

Note: EOT= end of treatment; FU= follow-up; Ncomp= number of comparisons; WL = wait-list; ES= effect size; *= statistically significant at p<.05

Table 5
The empirical status of third-wave behaviour therapies for the treatment of adult eating disorders

Therapy	Anorexia Nervosa		Bulimia Nervosa		Binge Eating Disorder	
	Evidence	RCT citations	Evidence	RCT citations	Evidence	RCT citations
Cognitive-behavioural therapy	EST	McIntosh et al. (2005); Zipfel et al. (2014); Touyz et al. (2013); Lock et al. (2013) Byrne et al. (2017)	EST	Agras et al. (2000); Fairburn et al. (1991); Fairburn, Kirk, O'Connor, and Cooper (1986); Poulsen et al. (2014); Goldbloom et al. (1997); Garner et al. (1993); Walsh et al. (1997); Fairburn et al. (2015); Fairburn et al. (2009); Wonderlich et al. (2014)	EST	Wilfley et al. (1993); Wilfley et al. (2002); Grilo, Masheb, and Wilson (2005); Agras et al. (1994); Ricca et al. (2001)
Interpersonal psychotherapy	Not EST	McIntosh et al. (2005)	EST	Agras et al. (2000); Fairburn et al. (1991); Fairburn et al. (2015)	EST	Wilfley et al. (1993) Wilfley et al. (2002) Wilson et al. (2010)
Dialectical behavioural therapy	Not EST	NA	Possibly efficacious	Safer et al. (2001); Hill et al. (2011); Chen et al. (2016); Klein et al. (2013)	Possibly efficacious	Masson et al. (2013); Telch et al. (2001); Safer et al. (2010); Chen et al. (2016); Klein et al. (2013)
Schema therapy	Not EST	NA	Possibly efficacious	McIntosh et al. (2016)	Possibly efficacious	McIntosh et al. (2016)
Compassion focused therapy	Not EST	NA	Possibly efficacious	Kelly et al. (2016)	Possibly efficacious	Kelly et al. (2016); Kelly and Carter (2015a)
Mindfulness-based interventions	Not EST	NA	Not EST	-	Possibly efficacious	Kristeller et al. (2014)
Acceptance and commitment therapy	Not EST	Parling et al. (2016)	Not EST	-	Not EST	-

Note: RCT= randomized controlled trial; EST= empirically supported treatment; NA= no trials available.

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