



Acceptance and commitment therapy (ACT) for eating disorders: A systematic review of intervention studies and call to action

Carly M. Onnink^a, Yvoni Konstantinidou^b, Ashley A. Moskovich^a, Maria K. Karekla^b, Rhonda M. Merwin^{a,*}

^a Duke University Medical Center, Department of Psychiatry and Behavioral Sciences, USA

^b University of Cyprus, Department of Psychology, Cyprus

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ABSTRACT

Acceptance and Commitment Therapy (ACT) is increasingly used to treat eating disorders (EDs); however, the evidence for ACT with EDs has not been the subject of a systematic review. The current study reviews the evidence of ACT for EDs through January of 2022. PubMed and PsycInfo were searched for treatment studies using three or more ACT processes with adolescents or adults with anorexia nervosa, bulimia nervosa, binge eating disorder and purging disorder spectrum diagnoses. Studies focusing primarily on obesity, weight loss or body image were excluded. Twenty-two intervention studies were identified with a combined total of 674 participants. Five were randomized controlled trials. While the majority of studies focused on anorexia nervosa, these tended to be smaller studies of fewer participants. Results indicated that ACT may show reasonable efficacy for improvements in ED symptoms. However, most studies lacked sufficient methodological rigor and were weak on two or more components of the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies. Future directions and limitations of using the EPHPP for quality assessment of psychological interventions are discussed, as well as strengths and weaknesses of the evidence base in light of the recent ACBS Task Force Report on the Strategies and Tactics of Contextual Behavioral Science Research.

1. Introduction

Eating disorders (EDs) carry a higher risk of premature death than any other mental health problem, barring opioid addiction (Chesney, Goodwin, & Fazel, 2014). Individuals with EDs have a high risk of mortality due to both suicide and starvation-related medical complications (Crow et al., 2009; Giovino et al., 2019). In addition to serious health consequences, EDs decrease the quality and vitality of an individual's life (Van Hoeken & Hoek, 2020).

Studies support family-based therapy (FBT) for children and adolescents with anorexia nervosa (AN) (Gorrell, Loeb, & Le Grange, 2019), with some preliminary evidence of this approach with adults with AN (e.g., MANTRA) (Startup et al., 2021). Enhanced cognitive behavior therapy (CBT-E) has also shown some efficacy with individuals with AN (Atwood & Friedman, 2020). With bulimia nervosa (BN) and binge eating disorder (BED), interpersonal therapy (IPT) (Miniati, Callari, Maglio, & Calugi, 2018) and CBT are empirically-supported treatment options (Hilbert, 2019; Slade et al., 2018). However, a significant

number of individuals do not respond optimally to these approaches; a 30-year longitudinal study of over 4000 participants with an ED diagnosis found that only 64% had full symptom recovery (Dobrescu et al., 2020), and drop out and relapse is high, particularly among individuals with AN (Dalle Grave, El Ghoch, Sartirana, & Calugi, 2015; Galsworthy-Francis & Allan, 2014). This has led to the exploration of acceptance and commitment therapy (ACT) to treat EDs, guided by evidence of ACT's efficacy with a wide range of other clinical issues, including those comorbid with EDs (e.g., anxiety, depression), and the match between the processes targeted in ACT and the factors implicated in ED development and maintenance. For example, a convergence of evidence indicates that experiential avoidance is associated with ED symptoms (e.g., escape from aversive self-awareness or emotions that are experienced as overwhelming and out of control) (Treasure et al., 2020; Wildes, Ringham, & Marcus, 2010). Individuals with EDs also tend to be cognitively and behaviorally rigid (e.g., Wang et al., 2021), and may benefit from treatments explicitly targeting psychological flexibility.

To our knowledge, there are only two reviews with a focus on ACT

* Corresponding author. Duke University School of Medicine, Department of Psychiatry and Behavioral Sciences.

E-mail address: rhonda.merwin@duke.edu (R.M. Merwin).

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for EDs. Manlick, Cochran, and Koon (2013) conducted a literature review focused on providing a rationale for using ACT for EDs, rather than a systematic review, and it did not report on the quality of the study methodology or fully outline treatment effects. Furthermore, since 2013, several new studies have been published. A recent systematic review was conducted by Di Sante, Akeson, Gossack, and Knäuper (2022), however, this review focused on dysregulated eating behaviors rather than eating disorders.

Other systematic reviews have examined third-wave therapies for EDs more broadly (e.g., Buerger, Vloet, Haber, & Geissler, 2021; Yu, Song, Zhang, & Wei, 2020). These reviews include dialectical behavior therapy (DBT) and other mindfulness-based therapies, in addition to ACT, and do not include all available ACT trials (Linardon, Fairburn, Fitzsimmons-Craft, Wilfley, & Brennan, 2017) and/or focus on one clinical problem or aspect of treatment (e.g., binge eating: Godfrey, Gallo, & Afari, 2015; ehealth interventions: Linardon, Gleeson, Yap, Murphy, & Brennan, 2019). Thus, there is a need for an up-to-date comprehensive review of the evidence specifically for ACT for EDs. Such a review will guide clinical decision-making and identify strengths and weakness as well as gaps for future research. It will also situate findings in the broader context of recent developments in the field such as the rise of process-based CBT (e.g., Hayes and Hofmann, 2018) and the Association for Contextual Behavioral Science (ACBS) Task Force Report on the Strategies and Tactics of Contextual Behavioral Science Research (Hayes et al., 2021).

2. Methods

2.1. Systematic review procedure

A systematic review of relevant literature (Fig. 1) in accordance to PRISMA guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) was performed by the first author. PubMed and PsycINFO databases were searched in February 2022. The search terms consisted of the following phrases and Boolean operators: (Acceptance and Commitment Therapy OR Acceptance Based Behavioral Therapy OR Emotion Acceptance Behavior Therapy) AND (eating disorder OR anorexia OR bulimia OR binge eating disorder OR disordered eating). Each search result was manually assessed: the results from both databases were combined, duplicates were identified and removed, the titles and abstracts of the remaining search results were initially screened, and the full-text of the remaining search results were then assessed for eligibility. Studies were included if they met the following criteria: (a) an ACT or ACT-based intervention was delivered, (b) the ACT intervention included at least 3 ACT processes, (c) the sample was individuals with clinically significant ED symptoms (either partial or full diagnostic threshold) as the primary issue, (d) the study used two or more validated measures, and (e) the study was published in English in a peer-reviewed journal. When it was unclear whether a study met inclusion criteria, the study was reviewed and discussed by the study team, including senior authors. Prevention studies and studies that targeted body image (rather than ED behaviors) were excluded. Studies on obesity and weight loss were excluded if the sample was not individuals with BED or binge eating behaviors. Avoidant Restrictive Food Intake Disorder and other eating and feeding disorders that commonly develop in infancy or early childhood and may be related to sensory qualities of food or aversive

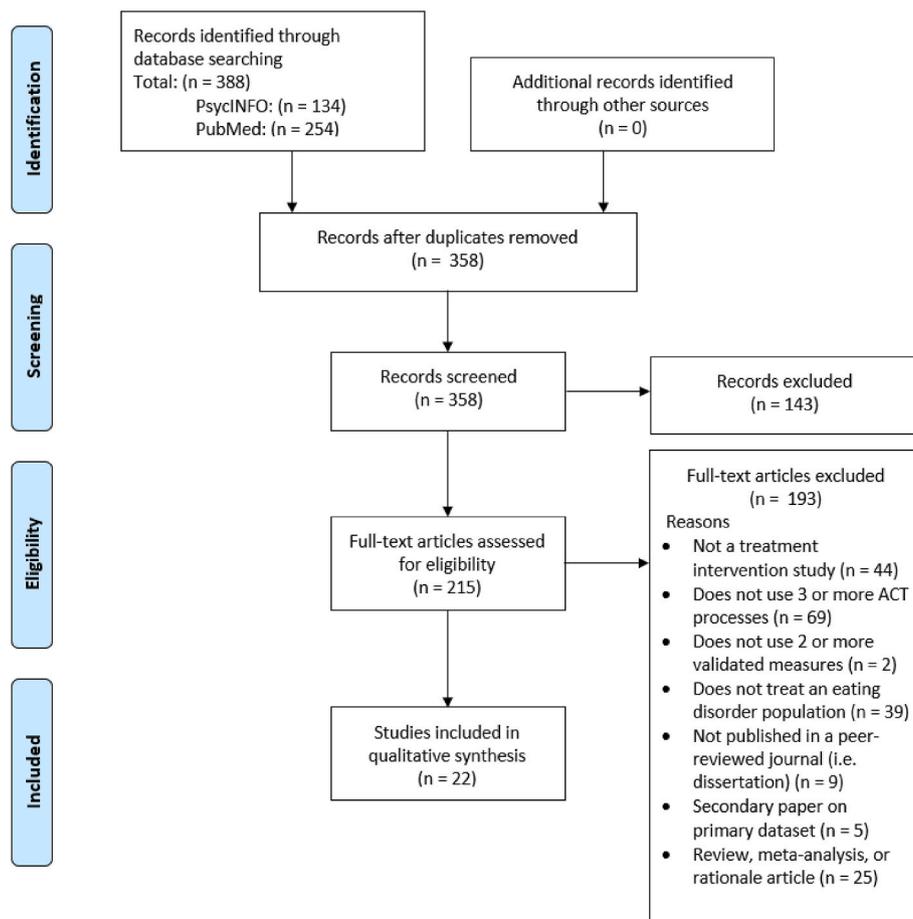


Fig. 1. PRISMA 2009 Flow diagram.

food experiences (e.g., choking) were not the focus of this review and were not identified with the aforementioned search terms. The authors maintained formal exclusion criteria and no articles were added from additional sources. In total, 22 studies met full inclusion criteria. See Fig. 1 for a flow diagram of the study selection process.

Included studies were assessed with the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies (see Table 1). The EPHPP was chosen due to its user-friendly dictionary and higher interrater reliability relative to the Cochrane Collaboration Risk of Bias Tool (Armijo-Olivo, Stiles, Hagen, Biondo, & Cummings, 2012). The EPHPP consists of the following six categories: control of selection bias, study design, control of confounders, blinding, data collection methods, and withdrawals and drop-outs. Two authors independently rated the research articles and then compared ratings. Incongruent ratings were resolved via discussion with the study team.

A meta-analysis was not performed due to the limited number of randomized controlled trials and heterogeneity of clinical populations. Therefore, this review is a narrative synthesis.

3. Results

3.1. Sample characteristics

The majority of included studies targeted one ED population: AN ($n = 10$), purging disorder (PD) ($n = 1$), BED ($n = 6$), and BN ($n = 1$). Several studies investigated a sample with multiple ED diagnoses ($n = 3$). Over half of the included studies ($n = 17$) had a clinical sample with diagnoses that were confirmed with a structured diagnostic interview. The sample size ranged from 1 to 140 participants, with a median of 19.5 and a total of 674 participants.

Most studies used adult samples where participants were at least 18 years of age ($n = 19$; 87%), some had adolescent samples ($n = 2$; 9%), and a few included a mix of both adolescents and adults ($n = 1$, 5%). The majority of studies had only female participants ($n = 15$; 68%). Seven (32%) studies included both men and women, although the vast majority of each of those samples consisted of women. Studies were

predominately conducted in an outpatient setting ($n = 21$; 95%) with one study utilizing a residential sample (Juarascio et al., 2013). Most studies were conducted in the United States ($n = 14$; 64%). Four (18%) studies were conducted in Sweden, two in Portugal (Duarte, Pinto-Gouveia, & Stubbs, 2017; Pinto-Gouveia et al., 2017), one in Spain (Martín-Murcia, Cangas Díaz, & Gonzalez, 2011), and one in Denmark (Corazon et al., 2018).

3.2. Study design and treatment conditions

The study designs in this review include case studies ($n = 4$), case series ($n = 5$), a case series with a nonconcurrent multiple baseline design ($n = 1$), single-arm open trials ($n = 4$), non-randomized controlled clinical trials ($n = 3$), and randomized controlled trials (RCTs) ($n = 5$). Of the eight trials with a control group, five had a comparison to an active control (treatment as usual, $n = 3$; cognitive behavioral therapy, $n = 1$; support group meetings, $n = 1$) and three had a comparison to a waitlist control.

The majority of studies ($n = 13$, 59%) used all six ACT processes in their intervention. One study used five processes (Pinto-Gouveia et al., 2017), one study used four processes (Evans, Murray, Muratore, Lantz, & Juarascio, 2019), and seven studies (32%) used three processes; all 22 studies included acceptance and values. All studies met the criteria of ACT as defined by this review, although some referred to their treatment by other names, such as Acceptance-Based Behavioral Therapy, Acceptance-Based Separated Family Treatment, Emotion Acceptance Behavior Therapy, Mindfulness and Acceptance-Based Treatment, and Nature-Based Therapy.

The majority of studies administered individual treatment ($n = 13$; 59%), some studies administered group treatment ($n = 6$; 27%), one study administered an in-person group session followed by an online-supported intervention (Duarte et al., 2017), one study administered an internet-based treatment (Strandskov et al., 2017), and one study administered individual treatment and a mobile phone application (Merwin et al., 2021). Treatment length varied widely, with the shortest being two sessions and the longest being 33–58 sessions. Of the trials

Table 1
EPHPP quality assessment of quantitative studies.

	Type	Control of Selection Bias	Study Design	Control of Confounders	Blinding	Data Collection Method	Withdrawals and Dropouts
Juarascio, Forman, & Herbert, 2010	RCT	W	S	S	W	S	W
Fogelkvist 2020	RCT	W	S	S	W	S	S
Duarte 2017	RCT	W	S	S	W	S	W
Strandskov 2017	RCT	W	S	S	W	S	M
Parling 2016	RCT	M	S	M	W	S	M
Corazon 2018	CCT	W	S	S	W	S	M
Pinto-Gouveia 2017	CCT	W	S	S	W	S	W
Juarascio, Forman, & Herbert, 2010	CCT	M	S	S	W	S	W
Merwin 2021	Open trial	M	M	W	W	S	M
Juarascio, Forman, & Herbert, 2010	Open trial	W	M	W	W	S	M
Timko 2015	Open trial	W	M	W	W	S	W
Wildes & Marcus, 2011	Open trial	W	M	W	W	S	M
Hill 2020	Case series	W	W	W	W	S	S
Evans 2019	Case series	W	W	W	W	S	S
Hill 2015	Case series	W	W	W	W	S	S
Merwin 2013	Case series	M	W	W	W	S	W
Wildes & Marcus, 2011	Case series	W	W	W	W	S	S
Berman 2009	Case series	M	W	W	W	S	S

Note: Weak (W); Moderate (M); Strong (S). When assessing withdrawal and drop-outs, the final follow-up assessment is used (per the EPHPP instructions), however, follow-up duration varies widely between the studies (ranging from none to 5 years).

that specified an exact number of treatment sessions conducted, the median treatment length was 14.5 sessions.

3.3. Primary outcome measures

As previously mentioned, over half of the studies administered a structured diagnostic interview, the Eating Disorder Examination (EDE) to confirm diagnosis, and in 11 studies, pre-post change on the EDE was a primary outcome measure. Studies predominately used self-report questionnaires for outcomes of interest, including the questionnaire version of the EDE (which correlates reasonably with the interview) (Mond, Hay, Rodgers, Owen, & Beumont, 2004). Ten studies also collected height and weight measurements and one study included a food challenge (Juarascio et al., 2013; Plasencia et al., 2019). The most commonly employed scales were the Eating Disorder Examination Questionnaire (EDE-Q) and variants of the Acceptance and Action Questionnaire (AAQ), (e.g., AAQ-II, Body Image AAQ, Weight AAQ). The EDE and EDE-Q are considered gold standard in ED treatment. The AAQ is the most commonly administered measure in ACT interventions, designed to capture process of change. However, many studies are unpowered to formally test the AAQ as a mediator and instead include the measure as an outcome of interest. The AAQ has recently been criticized for corresponding too closely with negative affect (e.g., Cherry, Hoeven, Patterson, & Lumley, 2021).

3.4. Results of methodological quality assessment

The ratings of methodological quality for case series, single-arm open trials, controlled clinical trials, and randomized control trials are reported in Table 1. The authors followed the EPHPP criteria of assigning a weak global score if two or more components were weak, a moderate global score if one component was rated weak, and a strong global score if no components were rated weak. Nearly all studies had an overall rating of weak. One had an overall rating of moderate (Parling, Cernvall, Ramklint, Holmgren, & Ghaderi, 2016). Weak categories were most commonly control of selection bias (i.e., samples were not randomly selected from a comprehensive list of individuals with EDs, but referred from a clinic or other source in a systematic manner or self-referred, and/or the percentage of individuals that were screened and agreed to participate was less than 60% or not reported) and blinding (i.e., the individual administering the assessments was not blinded to the participant's condition and/or blinding of the assessor was not reported, and the participants were aware of the research question). The case and single-arm studies had two components that were always weak: blinding and control of confounders. Given the current state of the evidence, individual components of relative strengths and weaknesses may be of greater interest and direct future research.

3.5. Study outcomes

The study outcomes at end-of-treatment and any follow-up time points are reported in Table 2 and Table 3. The current review identified ED behaviors as the primary outcomes of interest. Data that were extracted included ED symptom frequency measurements (e.g., number of purging episodes per week), ED symptom scales (self-report and interview based, e.g., EDE, EDE-Q), body mass index (BMI) and ED remission status. When possible, the clinical significance of the findings (pre to post) is noted. Clinical significance was defined as achieving remission status or reduction of symptoms below the threshold for diagnosis in individuals previously at or above threshold. This includes decreased frequency of binge eating or purging or meaningful improvements in BMI (e.g., an individual with AN restoring weight to BMI >18.5). Clinical significance was also denoted by reductions of ED symptoms on the EDE below or within one standard deviation of the mean of community norms (Fairburn, Cooper, & O'Connor, 2008) or as specified by the author (e.g., EDI scores no longer in clinical range).

Secondary outcome measures included processes of change in ACT-based interventions (e.g., measures of experiential avoidance or the inverse, acceptance, psychological flexibility and valued living) as well as measures of general psychological distress (e.g., anxiety, depression) and quality of life. When applicable, intent-to-treat analyses were specified. A narrative description of the included studies is provided below, with key findings considered in light of their methodological limitations.

3.5.1. Case studies

Four of the included studies were case studies. Heffner et al. (2002) conducted an ACT treatment for a fifteen-year-old adolescent with AN. The treatment included various metaphors and experiential exercises to promote acceptance of weight-related thoughts and feelings without overattachment (e.g., Chinese finger trap, Chess board, Thought Parade) and to facilitate values authorship and engagement in valued activity beyond weight control (e.g., Funeral Meditation, Valued Directions Map). The client demonstrated improvements in BMI and ED symptoms at end-of-treatment. More specifically, at the end-of-treatment, she had reached her goal weight and her Eating Disorder Inventory—2 (EDI-2) drive for thinness score was no longer in the clinical range. Her body dissatisfaction score remained in the clinical range at end-of-treatment; however, consistent with ACT interventions, the therapeutic aim was acceptance of distressing thoughts and feelings about the body rather than a decrease in body dissatisfaction in itself.

Martín-Murcia et al. (2011) conducted an ACT-based treatment for a seventeen-year-old adolescent diagnosed with AN and obsessive-compulsive disorder. Before treatment, she reportedly was obsessive regarding food, appearance, and schoolwork, and avoided social contact with classmates. Treatment took the form of functional analytic psychotherapy with ACT components, including clarification of values, openness to experience, and acceptance of emotions. After treatment, her EDI-2 scores, eating behavior, and weight were no longer in the clinical range. The authors also reported the client had increased social activities, leisure activities, and social relationships, and decreased family conflict.

Plasencia et al. (2019) conducted six sessions of an acceptance-based interoceptive exposure intervention to treat a 16-year-old adolescent with AN as a precursor to 20 sessions of family-based therapy. All exposure exercises consisted of the participant drinking a milkshake while tolerating thoughts and feelings of disgust. In session 2, the participant practiced nonjudgmental observation (e.g., eating and describing one raisin). In session 3, the therapist used a breathing exercise to explain the difference between controlling and accepting an experience. Session 4 and 5 taught the importance of willingness to experience discomfort for the sake of living by one's personal values. The 6th and final session reviewed how the participant can incorporate acceptance and values into their exposure exercises after treatment. After these 6 sessions, the participant had improved BMI (reaching her goal weight), decreased ED symptomatology on the Youth Eating Disorder Examination Questionnaire Global, and increased calorie consumption during an open meal.

Masuda et al. (2016) used ACT to treat a twenty-one-year-old Latina woman with purging disorder (PD). Prior to treatment, she reportedly purged almost daily and was experiencing distress and shame about her behavior. Treatment included the normalization of suffering and the promotion of value-congruent action, openness to experience, and self-compassion. Her frequency of purging decreased throughout treatment and there was no purging reported during follow-up. Her experiential avoidance, as assessed by the AAQ-2, initially increased at the onset of treatment and fluctuated throughout treatment. However, improvements were observed at follow-up with scores below baseline level at both the 3-month and 12-month assessments. Body image flexibility, as assessed by the BIAAQ, generally improved over the course of treatment and showed continued improvements at 3-month and 12-month follow-up assessment time points. Quality of life domains either

Table 2
Case and single-arm studies.

Study	Design	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome at End-of-Treatment	Secondary Outcomes	Follow-Up
Plasencia, Sysko, Fink, and Hildebrandt (2019)	Case Study	AN	N = 1 Adult	O	6 sessions	3/6 + explicit exposure	BMI Improved; Calorie consumption increased during an open meal; Global EDE-Q and Restraint, Weight Concern, and Shape Concern scores demonstrated clinically meaningful change (p 's < 0.05).	Disgust Scale-Revised scores increased, indicating increased tolerance to the experience of disgust	N/A
Masuda, Ng, Moore, Felix, and Drake (2016)	Case Study	PD*	N = 1 Adult	O	10 sessions	6/6	Frequency of purging decreased from almost daily to about once a week during treatment; EDE-Q increased mid-treatment but was lower than baseline level at end-of-treatment.	Disordered eating cognition (MAC-R) was generally stable; Psychological inflexibility (AAQ-II) initially increased and then generally decreased over time; Body image flexibility (BIAAQ) increased over time; Impairment from ED symptoms (CIA 3.0) and general psychological distress (GHQ-12) decreased; QOL improved (WHOQOL-BREF).	3, 12 months Purging improvement maintained (0 episodes during the week assessment at 3 and 12 months) EDEQ-global, MAC-R, AAQ-II, and BIAAQ further improved; CIA 3.0 and GHQ-12 generally remained improved; QOL findings were mixed
Martín-Murcia et al., 2011	Case Study	AN	N = 1 Adult	O	20 sessions (+3 “follow up” sessions at 3, 6 and 12 months)	3/6	BMI improved; Restrictive eating decreased; Purging decreased; EDI-2 scores no longer met clinical significance.	Marked improvement on clinical syndrome and personality subscales (MCMI-III); Increase in valued behaviors (measure created by authors): Social activities increased, leisure activities increased, social relationships increased, and family disruptions decreased.	3, 6, 12 months BMI, restrictive eating, and purging improvements were all maintained
Heffner, Sperry, Eifert, and Detweiler (2002)	Case Study	AN	N = 1 Adult	O	14 sessions (+4 monthly “follow up” sessions)	6/6	BMI improved to target by termination; Decreased drive for thinness (DT subscale of the EDI-2); Body dissatisfaction (BD subscale of	N/A	1, 2, 3, 4 months BMI improvement maintained; menses returned. Body dissatisfaction not improved

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Table 2 (continued)

Study	Design	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome at End-of-Treatment	Secondary Outcomes	Follow-Up
Hill, Schaefer, Spencer, and Masuda (2020)	Nonconcurrent Multiple Baseline	AN-spectrum* (one participant met criteria for current AN; another subthreshold AN; another with a history of AN but currently normal BMI)	N = 3 Adults	O	10 sessions	6/6	the EDI-2) was not improved. Improvement in chosen target behavior (e.g., eating a full meal, body checking, wearing valued clothing choice); BMI improved for the underweight participant, other 2 participants mostly maintained their normal BMI; EDE-Q Global decreased (3/3 participants).	Improvement in body image flexibility (BI-AAQ), self-compassion (SCS-SF) and general distress (GHQ-12) (3/3 participants).	3 months BMI and EDE-Q Global improvements maintained (3/3 participants); body image flexibility (BIAAQ) continued to improve; Improvements in self-compassion (SCS-SF) and general distress (GHQ-12) largely maintained.
Evans et al., 2019 ^a	Case Series	BED*	N = 4 Adults	O	10 sessions (the first session was an extended session lasting 3 h)	4/6	Decreased binge eating episodes (4/4); Decreased BMI (4/4 participants); EDE-Q Global score decreased (2/4 participants) (EDE-Q Global increased in 2/4 participants).	Increased psychological flexibility (AAQ-II) (3/4 participants); decreased depression (BDI-II) (4/4 participants) and improved quality of life (QOLI) (3/4 participants); emotion regulation difficulties (DERS) findings mixed.	N/A
Hill, Masuda, Melcher, Morgan, and Twohig (2015)	Case Series	BED*	N = 2 Adults	O	10 sessions	6/6	Decreased binge eating episodes (2/2 participants); Decreased EDE-Q scores (2/2 participants); One participant no longer met criteria for BED.	Decreased emotional eating (EES), eating disorder cognition and functional impairment (MAC-R, CIA 3.0) and increased body image flexibility (BI-AAQ) (2/2 participants).	3 months Improvements maintained or further improved for one participant; One participant returned to baseline levels of binge eating, emotional eating (EES) and eating disorder cognition (MAC-R), but maintained improvement in functional impairment (CIA 3.0).
Merwin, Zucker, & Timko, 2013 ^b	Case Series	AN-spectrum* (included adolescents with restrictive eating and weight loss who dropped 2 major BMI percentiles and	N = 6 Adolescents and their caregiver(s)	O	20 sessions (16 individual and 4 conjoint family sessions)	6/6	Reached ideal BMI (5/6 participants); EDE Global scores decreased (4/6 participants); Decreased anorectic	Decreased avoidance and fusion (AFQ-Y) (4/6 participants) Decreased anxiety (BASC-2) (3/6 participants); Decreased social	3 months Not reported

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Table 2 (continued)

Study	Design	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome at End-of-Treatment	Secondary Outcomes	Follow-Up
		were less than 90% of ideal body weight)					behavior observed by caregivers (ABOS) (5/6 participants). One adolescent failed to make adequate gains and was referred to a higher level of care.	stress (BASC-2) (3/6 participants); improved interpersonal relations (BASC-2) (4/6 participants), self-esteem (3/6 participants) (BASC-2), self-reliance (BASC-2) (4/6 participants); personal adjustment (4/6 participants) (BASC-2); Improved quality of life (YQOL-R) (2/6 participants). Caregivers reported decreased caregiver burden (ECI) (4/6 families) and anxiety (BSI) (3/6 families).	
Wildes & Marcus, 2011	Case Series	AN*	N = 4 Adults	O	24 sessions	3/6	BMI improved (3/4 participants); EDE Global score decreased (2/4 participants). One participant lost weight and was referred to a higher level of care.	Experiential avoidance decreased (AAQ) (3/4 participants); depression decreased (BDI-II) (4/4 participants), anxiety findings mixed (BAI) (2/4 participants decreased, one increased and one did not change), quality of life improved (EDQOL) (3/4 participants).	N/A
Berman, Boutelle, and Crow (2009)	Case Series	AN-spectrum Previously treated; Unremittent (Included participants above the BMI threshold for AN according to the DSM criteria at the time of study)	N = 3 Adults	O	17 sessions (option of 2 additional family sessions)	6/6	BMI findings mixed (one improved, 2 stayed about the same); EDE-Q Global score decreased (2/3 participants).	Body image flexibility improved (BI-AAQ) (3/3 participants); Global psychiatric symptom severity improved (SCL-90-R) (3/3 participants; 2 changed categorically); depression (BDI-II) and anxiety (BAI) decreased for one participant (data	1 year EDE-Q Global improved overall but one participant rebounded to near baseline level at follow-up; BMI findings maintained; body-image flexibility (BI-AAQ) and psychiatric symptom (SCL-90-R) improvements

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Table 2 (continued)

Study	Design	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome at End-of-Treatment	Secondary Outcomes	Follow-Up
								missing, increased or the same for others)	were mostly maintained (3/3 participants); depression further improved (BDI) (2/3 participants), but increased in one participant; Anxiety (BAI) unchanged or slightly worse from post.
Merwin et al. (2021)	Open Trial	Mixed clinical sample of eating disorders in type 1 diabetes (ED-DMT1)* BN- spectrum ($n = 18$); BED ($n = 2$); purging disorder ($n = 3$).	$N = 28$ enrolled; $n = 23$ started treatment and $n = 20$ completed treatment Adults	O	12 sessions with option for 3 additional tapering sessions Use of a mobile app in between sessions	6/6	EDE Global score and Diabetes eating problems (DEPS-R) significantly decreased (Cohen's $d = 0.90-1.79$). Improvement in glycemic control (M decrease in HbA1c = -0.9% ; Cohen's $d = 0.44$).	Psychological flexibility (AADQ) significantly increased (Cohen's $d = 0.94$; Values obstruction and progress improved (VQ) significantly, evidencing a positive linear trend across sessions. Diabetes self-management (DSMQ) and diabetes distress (DDS) significantly improved (Cohen's $d = 0.92-1.38$); Depression (significantly improved PROMIS-D) (Cohen's $d = 0.55$); Anxiety (PROMIS-A) not improved.	3, 6 months Improvements were maintained, however, some participants continued in treatment, contaminating follow-up.
Juarascio et al., 2017	Open Trial	BED*	$N = 19$ enrolled; $n = 17$ completed treatment Adults	O	10 1.5–2 h Group sessions	3/6 Explicitly incorporated elements of DBT	EDE Global and binge frequency significantly decreased (linear and quadratic effects showing rapid early change and then continued slow improvement). Changes in EDE Global and subscale scores (Partial $\eta^2 = 0.25-0.53$). 59% of participants were abstinent for binge eating at end of treatment.	Psychological flexibility (AAQ-II), Willingness (FAAQ), urgency to act impulsively when experiencing negative affect (UPPS), Nonacceptance (DERS) significantly improved (Partial $\eta^2 = 0.19-0.48$). Depression (BDI-II) (Partial $\eta^2 = 0.26$) and quality of life (QOLI) significantly improved.	3 months Outcomes maintained or continued to improve. 60% of participants abstinent for binge eating.
	Open Trial			O		6/6			

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Table 2 (continued)

Study	Design	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome at End-of-Treatment	Secondary Outcomes	Follow-Up
Timko, Zucker, Herbert, Rodriguez, and Merwin (2015)		AN-spectrum* (included adolescents with restrictive eating and weight loss who dropped 2 major BMI percentiles and were less than 90% of ideal body weight)	N = 47 enrolled; n = 31 completed treatment Adolescents and their caregiver(s)		20 sessions (16 separated and 4 conjoint family sessions)		BMI significantly improved; nonlinear with initial acceleration followed by slowing Adolescents generally reached 95% ideal body weight by week 12. EDE Subscales and Global score significantly decreased, Cohens <i>d</i> = .78–1.22. Full remission in 48.9% of total sample (67.7% of treatment completers); Partial remission in 29.88% of total sample (32.3% of treatment completers).	Adolescent psychological flexibility (AFQ-Y) significantly increased, the effect was nonlinear. Caregiver psychological flexibility (AAQ-II) and emotional acceptance (DERS-Acceptance subscale) significantly increased (effects linear).	3 months Data only available for n = 11.
Wildes, Marcus, Cheng, McCabe, and Gaskill (2014)	Open Trial	AN*	N = 24 enrolled; n = 13 completed treatment Adolescents and adults ≥17 years of age	O	33 to 58 sessions	3/6	BMI Improved, (Cohen's <i>d</i> = 1.0); EDE Global scores significantly decreased (Cohen's <i>d</i> = 1.6). 46.2% of treatment completers met criteria for full remission with BMI > 18.5 and EDE within 1 SD of normal at end of treatment.	Psychological flexibility (AAQ-II) increased significantly (Cohen's <i>d</i> = 2.6), significant improvement in depression (BDI-2) (Cohen's <i>d</i> = 2.3) and anxiety (BAI) (Cohen's <i>d</i> = 2.9) and quality of life (EDQOL) (Cohen's <i>d</i> = 2.3).	3, 6 months All outcomes remained improved relative to baseline, however, remission rate dropped to 30.8% at 6 months.

Note: Outpatient (O); Inpatient (I); Measures—Acceptance and Action Questionnaire (AAQ); Acceptance and Action Questionnaire II (AAQ-II), Anorectic Behavior Observation Scale (ABOS), Avoidance and Fusion Questionnaire for Youth (AFQ-Y), Beck Anxiety Inventory (BAI), Beck Depression Inventory-II (BDI-II), Behavior Assessment System for Children-2 Adolescent Version (BASC-2), Body Image-Acceptance and Action Questionnaire (BIAAQ), Brief Symptom Inventory (BSI), Clinical Impairment Assessment 3.0 (CIA 3.0), Diabetes distress scale (DDS), Diabetes eating problems survey – revised (DEPS-R), Diabetes self-management questionnaire (DSMQ), Difficulties in Emotion Regulation Scale (DERS), Experience of Caregiving Inventory (ECI), Eating Disorder Diagnostic Scale (EDDS), Eating Disorders Examination Interview (EDE), Eating Disorder Examination Questionnaire (EDE-Q), Eating Disorder Inventory 2 (EDI-2), Emotional Eating Scale (EES), Eating Disorder Quality of Life Questionnaire (EDQOL), Food Acceptance and Awareness Questionnaire (FAAQ), General Health Questionnaire-12 (GHQ-12), Millon Clinical Multiaxial Inventory-III (MCMI-III), Mini International Neuropsychiatric Interview (MINI), Mizes Anorexic Cognition-Revised Clinical Impairment Assessment 3.0 (MAC-R), PROMIS Short Form Depression 8a (PROMIS-D), PROMIS Short Form Anxiety 8a (PROMIS-A), Quality of Life Inventory (QLI), Self-Compassion Scale–Short Form (SCS-SF), Symptom Checklist 90 Revised (SCL-90-R), UPPS Impulsive Behavior Scale (UPPS), Values Questionnaire (VQ), World Health Organization Quality of Life scale-Short Version (WHOQOL-BREF), Youth Quality of Life-Revised (YQOL-R), HbA1c = Hemoglobin A1c (% of red blood cells that are glycosylated).

ITT = Intent to Treat.

FU = Follow Up.

Remission criteria Courturier and Lock, 2006; Full = 95% EBW + EDE within 1 SD of normal; Partial = >90% EBW irrespective of EDE scores.

Recovery rates: (1) BMI > 18.5, (2) EDE Global score < 1.74 (3) BMI > 18.5 and EDE < 1.74.

^a Participants are individuals with less optimal outcomes from a Juarascio, Forman, & Herbert, 2010 study – seeking to lose weight 1 year later, “booster” treatment (phase II).

^b Participants were the first cohort recruited for the Timko paper – included in that sample.

Table 3
Parallel group design studies.

Study	Design	Treatment Conditions	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome	Secondary Outcome	Follow-up
Corazon et al. (2018)	CCT	ACT + nature vs. Support Group	BED*	N = 20 enrolled; n = 15 completed treatment; n = 15 analyzed Adults	O	12 3-h Group sessions (ACT); 10 Group sessions (Support Group)	6/6	Group comparisons were not conducted. Significantly fewer binge eating episodes in the ACT group (Effect size r in ACT = 0.54 vs r for Support group = 0.14). EDE Global scores decreased in both groups, with larger reductions in ACT (ns change in this small sample).	Psychological wellbeing (PGWBI) improved in both groups, with a larger effect observed for the ACT group (Effect size r in ACT = 0.49 vs r for Support group = 0.23). Self-esteem (RSE) significantly improved for the ACT group but did not for the control group (Effect size r in ACT = 0.59 vs r for Support group = 0.16).	N/A
Pinto-Gouveia et al. (2017)	CCT	ACT + explicit mindfulness and compassion focus vs. WLC	BED*	N = 59 enrolled; n = 54 received allocated intervention; n = 36 analyzed (n = 5 dropped out, n = 18 lost to contact for post treatment assessment) Adults	O	12 2.5 h Group sessions	5/6	Significant interaction ACT > WLC in reducing EDE Global scores and binge eating scale scores (BES) (Partial η^2 = 0.29–0.42) Cohen's d for change in ACT group = 1.52–1.58.	Significant interaction for change in body image psychological inflexibility (BI-AAQ), body image cognitive fusion (CFQ-BI), external shame (OAS), self-judgement (SCS), depression (BDI-I) and Quality of life (Obesity-related well-being questionnaire), Partial η^2 = 0.16–0.36. Cohen's d for change in ACT group = 0.89–1.37.	3, 6 months Effects largely maintained.
Juarascio et al. (2013)	CCT	ACT + TAU vs. TAU	Mixed clinical AN-spectrum (n = 66)*, BN-spectrum (n = 74)*	N = 140 enrolled; n = 120 completed treatment (n = 18 no longer interested in participating, did not complete baseline	R	~5 Group sessions (Range 0–11, SD = 2.51) In addition to other TAU residential programming.	6/6	No significant interaction. EDE Global scores significantly decreased in both conditions (Partial η^2 = 0.65). 38% of ACT + TAU had EDE-	ACT + TAU greater but non-significant improvements in psychological flexibility (AAQ-II). In the ACT + TAU group, AAQ-II did not mediate	6 months ACT + TAU had lower rehospitalization rates than TAU (18% vs. 3.5%)

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Table 3 (continued)

Study	Design	Treatment Conditions	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome	Secondary Outcome	Follow-up
				assessment; n = 2 left facility due to insurance) Adults				Q global scores within 1 SD of normative range, compared to 17% of TAU. ACT + TAU group increased consumption in food challenge by 24.88% while the TAU group increased by 11.90%.	treatment effects on EDE-Q Global scores, but acceptance/willingness assessed with the Before Session Questionnaire did.	
Juarascio et al. (2021)	RCT	ACT vs. CBT	BN-spectrum	N = 44 enrolled; n = 26 completed treatment Adults	O	20 sessions	3/6	ITT analysis Group comparisons were not conducted. Both groups showed large decreases in the frequency of binge eating episodes and compensatory behaviors (Cohen's d = 1.21–1.77) and EDE Global scores (Cohen's d = 1.51–1.69). Larger effects were observed in the ACT group.	Both groups showed improvements acceptance and action (AAQ), values-based decision-making (VLQ), depressive symptoms (BDI-II), quality of life (QoL), emotional clarity and emotion modulation (DERS) (Cohen's d = 0.25–1.38). Larger effects observed in the ACT group.	6 months Improvements were largely maintained; Depression (BDI-II), quality of life (QoL), acceptance (AAQ) and emotion modulation (DERS) continued to improve.
Fogelkvist, Gustafsson, Kjellin, and Parling (2020)	RCT	ACT vs. TAU	Mixed clinical sample of ED patients with residual symptoms AN-spectrum (n = 36)*; BN-spectrum (n = 27)*; BED-spectrum (n = 13*); purging disorder (n = 13)*; NOS (n = 7)*.	N = 99 enrolled; n = 88 received intervention (of the n = 52 assigned to ACT, n = 5 never began treatment; n = 5 dropped) Adults	O	12 2-h Group sessions	6/6	ITT analysis Significant interaction Both groups had significant decreases in EDE-Q scores, but ACT > TAU.	ITT analysis Significant interaction ACT > TAU on change in mindful awareness (MAAS), body shape concerns (BSQ), and body checking (BCQ).	2 years ACT > TAU for continued improvements (Cohen's d = 0.43–0.64). ACT < TAU care consumption during follow-up than the TAU.
Duarte et al. (2017)	RCT	ACT + explicit compassion focus vs. WLC	BED*	N = 33 enrolled; n = 20 completed treatment; n = 20 analyzed. Adults	O	One 2.5 h session with 4 weeks of self-led practice	3/6	Significant interaction ACT > WLC in decreasing binge eating and EDE scores (Partial $\eta^2 = 0.24-0.78$). Cohen's d for	Significant interaction ACT > WLC for cognitive fusion with food cravings (CFQ-FC), body image flexibility (BI-AAQ),	1 month Effects maintained.

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Table 3 (continued)

Study	Design	Treatment Conditions	Diagnosis *Explicitly states confirmed with structured diagnostic interview (SCID or EDE)	Participants	Setting	Dose All sessions individual unless otherwise specified.	ACT Processes	Primary Outcome	Secondary Outcome	Follow-up
Strandskov et al. (2017)	RCT	ACT vs. WLC	BN* (n = 36), EDNOS* (n = 56)	N = 92; n = 77 completed treatment Adults	O	8 week internet intervention	6/6	ITT Analysis Significant interaction ACT > WLC in decreasing EDE-Q Global and Subscale scores (Cohen's d = .54) and Body Shape Concerns (BSQ-8C) (Cohen's d = 0.48). Change in EDE-Q Global in ACT group, Cohen's d = 0.83 53.5% of ACT vs 23.8% of WLC reached clinically significant improvement on the EDE-Q.	change in ACT group = 0.89 for both outcomes. depression and stress (DASS) (Partial η ² = 0.25–0.44). Cohen's d for change in ACT group = 0.72–0.89.	N/A
Parling et al. (2016)	RCT	ACT vs. TAU	AN spectrum* (full, partial and subthreshold AN)	N = 43; n = 29 completed treatment Adults	O	19 sessions	6/6	ITT analysis No significant interactions Both groups improved on BMI and EDE-Q Global scores.	ITT analysis No significant interactions Both groups improved on body shape dissatisfaction (BSQ), quality of life (QOLI).	6, 12, 18, 24 months and 5 years BMI and EDE-Q Global score improved for both groups (Cohen's d = 0.52–1.02).

Note: Specifies if group comparisons were conducted, and if so, if there was a significant interaction.

Specifies ITT when researcher used Intent to Treat principles.

Residential (R); Outpatient (O); Inpatient (I); Clinical Control Trial (CCT); Randomized Control Trial (RCT); Treatment as Usual (TAU); 'Waitlist Control (WLC); Outcome measures— Acceptance and Action Questionnaire II (AAQ-II), Beck Depression Inventory-I (BDI-I), Beck Depression Inventory–II (BDI-II), Binge Eating Scale (BES), Body Checking Questionnaire (BCQ), Body Image-Acceptance and Action Questionnaire (BI-AAQ), Body Shape Questionnaire (BSQ), Body Shape Questionnaire (BSQ-8C), Clinical Impairment Assessment Scale (CIA), Cognitive Fusion Questionnaire-Body Image (CFQ-BI), Cognitive Fusion Questionnaire—Food Craving (CFQ-FC), Depression Anxiety and Stress Scales (DASS), Difficulties in Emotion Regulation (DERS), Eating Disorder Examination (EDE), Eating Disorder Examination Questionnaire (EDE-Q), Other as Shamer Scale (OAS), Psychological General Well-Being Index (PGWBI), Quality of Life Inventory (QOLI), Rosenberg Self-Esteem Scale (RSE), Self-Compassion Scale (SCS), Valued Living Questionnaire (VLQ).

remained at normative levels or improved throughout treatment and into the follow-up period.

In summary, the primary advantage of case studies is that they allow a deep dive into the individual clinical presentation and ACT intervention strategy. All the case studies describe clinically meaningful change for the individual(s) treated (either reaching goal weight or achieving scores out of the clinical range following treatment). However, because these studies are uncontrolled, it is unknown whether these changes would be observed with time alone, are due to attention or other factors not specifically related to the ACT intervention, or whether they would

generalize to other individuals (particularly given the high potential for selection bias).

3.5.2. Case series

Six of the included studies were case series. Four of these case series examined individuals with either AN or restrictive eating behavior. Merwin et al. (2013) conducted a pilot study of Acceptance-Based Separated Family Treatment for adolescents with AN (full and sub-threshold). The adolescents and caregivers were seen separately for most of the sessions, with conjoint sessions during the latter part of treatment.

Treatment included experiential exercises and metaphors specific to openness to experience, awareness of thoughts, and valued action. Sessions with caregivers addressed caregiver distress and psychological barriers to facilitating weight restoration and caregiver self-care, among other topics. Five out of six adolescents restored their body weight and the majority showed improvements in ED symptoms. The majority (four of six) achieved EDE scores within one standard deviation of the mean score of healthy adolescents and demonstrated improvements in psychological flexibility, as assessed by the Avoidance and Fusion Questionnaire for Youth (AFQ-Y). Over half showed improvements in psychological well-being (e.g., decreased anxiety, depression, social stress). Caregiver mental health also improved.

Berman et al. (2009) conducted a case series of ACT for three individuals that had been previously treated for AN and exhibited an unremitting course. Treatment included exposure to feared food, mindfulness training, acceptance of unpleasant emotions, body image exposure exercises, and values clarification and commitment. BMI was improved or maintained. Two of the three participants evidenced clinically significant improvements in ED symptomatology at end-of-treatment and all three reported levels below baseline at 1-year follow-up. All participants showed improvements in body image flexibility at end-of-treatment and had higher scores relative to baseline at 1-year follow-up.

Wildes and Marcus (2011) conducted a case series of an Emotion Acceptance Behavior Therapy with individuals with AN. The total sample was five; however, one adult dropped out after two sessions, leaving three adults and one adolescent. Treatment focused on emotional awareness, discouragement of emotional avoidance, and encouragement of valued actions. Three of the four individuals had weight gain that, while slow or modest, was likely clinically significant, decreased anxiety and depression, and improved quality of life. One participant continued to deteriorate. This participant had the lowest starting BMI and was withdrawn and referred to inpatient treatment, common in the course of unremitting AN.

Two of the case series focused on BED. Hill et al. (2015) conducted an ACT intervention for two women with BED. The treatment included clarification of how binge eating interfered with their values, practice of acceptance and mindfulness skills, and commitment to valued living. There was a reduction in binge eating for both participants, and one participant no longer met diagnostic criteria for BED at end-of-treatment. Both participants had improved psychological flexibility for body image.

Evans et al. (2019) developed an ACT-based weight loss treatment for four individuals with binge eating symptomatology. Treatment included DBT-based coping strategies, willingness and defusion skills, and values-oriented goal setting. All four participants experienced gradual weight loss and decreased binge eating frequency, and decreased depression. However, only two evidenced clinically significant improvement on the EDE-Q. The other two participant EDE-Q scores increased. Quality of life scores improved and psychological flexibility improved for most participants.

In summary, clinically meaningful change was observed for individuals with AN and BED with ACT treatment. However, in some cases, ED symptoms did not improve (unremitting AN) or increased (EDE scores in BED). Results of these studies must be interpreted with caution due to methodological weaknesses, including the small number of cases and lack of experimental control.

3.5.3. Multiple baseline design

Hill et al. (2020) conducted a nonconcurrent multiple baseline study of compassion-focused ACT for three women with restrictive eating and problematic body-checking. Treatment included mindfulness practices and experiential exercises with an emphasis on self-compassion. All three participants had improvements in body checking, self-compassion, and chosen valued behaviors, and improvements were largely maintained at the 3-month follow-up. Two of the three participants evidenced

clinically significant improvements in the EDE scores pre to post (one participant had an EDE score already well below community norms). Body image psychological flexibility improved across all participants at end-of-treatment and continued to improve over follow-up. The repeated measurement during the baseline phase provides some within-person control, but due to other limitations, the study is rated as methodologically weak overall.

3.5.4. Open trials

Four of the included studies were uncontrolled open trials of ACT. Two open trials examined ACT treatment for AN (Timko et al., 2015; Wildes et al., 2014). Wildes et al. (2014) conducted an open trial of Emotion Acceptance Behavior Therapy using 3 core processes (acceptance, present-moment awareness, and values) for 24 participants aged 17 or older with AN. For the full sample of participants, the average BMI increased from 17.5 at pre-treatment to 18.5 at post-treatment and 18.9 at 6-month follow-up (average BMI was 19.1 at post-treatment and 19.3 at 6 month follow-up for treatment completers). Participants also reported significant improvement in depression, anxiety, and quality of life and psychological flexibility. Fifty-four percent of participants completed the intervention (others dropped out or were withdrawn).

Timko et al. (2015) was an expansion cohort of Merwin et al., 2013 and examined an Acceptance-based Separated Family Treatment using the 6 core processes of ACT for 47 adolescents with threshold or sub-threshold AN. Forty-nine percent of the full sample of adolescents who enrolled in the study achieved full remission. Adolescent psychological flexibility scores also significantly increased. Seventy-five percent of adolescents who were enrolled, completed treatment ($n = 31$) or had early symptom remission ($n = 4$).

One open trial examined ACT for BED. Juarascio, Manasse, Schumacher, Espel, and Forman (2017) conducted a preliminary test of an acceptance-based behavioral treatment using 3 core ACT processes (acceptance, defusion and values) with 19 adults with BED. Global ED symptoms, binge frequency, depression, and quality of life all improved over the course of the intervention and had significant fixed linear effects of time. Over half of the enrolled participants were abstinent from binge eating at the end of treatment. Decreased experiential avoidance was associated with improved ED pathology. Treatment retention was 90%.

Merwin et al. (2021) conducted an open trial of ACT for 28 individuals with type 1 diabetes and EDs (primarily BN spectrum). ACT was delivered over 12 outpatient therapy sessions and in-between sessions via a mobile phone application. The majority of participants who started treatment (87%), completed it. Overall, participants had clinically and statistically significant improvements in ED symptoms and significantly decreased depression and diabetes-related distress. Glycemic control improved, with an average reduction of Hemoglobin A1c of 0.9% (above the threshold for clinically meaningful change); 53% of participants with poor glycemic control had clinically meaningful change in Hemoglobin A1c. Participants also reported significantly increased psychological flexibility with diabetes-related thoughts and feelings and made progress in acting on their personal values.

Overall, open trials on ACT with EDs indicate clinically significant symptom reduction in larger cohorts of participants (rather than one or several individuals) with AN, BED, and BN-spectrum diagnoses. Most of these studies indicate high retention. However, these findings are juxtaposed to the methodological limitations of an open trial or single-arm study, and self-selection in some cases, and without a control group, it is unclear whether changes are due to time alone, attention, or other nonspecific factors. Notably, process measures changed as expected with intervention, and while not strong evidence, may suggest changes are related to intervention. Taken together, study outcomes suggest that ACT is acceptable and feasible to implement with individuals with EDs. Data signal possible efficacy, warranting further investigation in controlled trials.

3.5.5. Non-randomized design with control

Three of the studies included in the review used a non-randomized design with a control. Juarascio et al. (2013) compared treatment as usual (TAU) to TAU + ACT with 140 women with AN spectrum or BN spectrum diagnosis in a residential treatment facility. The women in TAU + ACT received twice weekly ACT group sessions, in addition to typical services. While individuals that received TAU + ACT had slightly better outcomes for ED symptoms, the difference was not statistically significant. The same was true for psychological flexibility. When examining clinically meaningful change (in treatment completers only), Juarascio et al. report 38% of the TAU + ACT vs 17% of the TAU group had achieved EDE scores within one standard deviation of community norms, and TAU group participants were significantly more likely to be re-hospitalized.

Pinto-Gouveia et al. (2017) conducted a controlled longitudinal design comparing an ACT-based treatment to a waitlist control in a sample of 59 outpatient obese or overweight women with BED. The treatment included five core ACT processes (values, experiential distancing/defusion, mindfulness/present-moment awareness, acceptance/willingness, and committed action). There was a significant interaction with ACT outperforming the waitlist control (but with notable attrition from baseline to the final assessment). Outcomes were largely maintained at 3 and 6 month follow-up. Participants in the ACT group reported significantly reduced ED symptoms, depression, and body image cognitive fusion, as well as significantly increased quality of life. Changes in ED symptoms were clinically significant (reduced to within one standard deviation of the mean of community samples).

Corazon et al. (2018) used what they described as Nature Based Therapy with an ACT approach to treat 20 adults with BED. All 6 components of ACT were used; sessions were conducted in a garden and mindfulness exercises were focused on the natural environment. Support group meetings were used as a control group. However, direct group comparisons were not conducted and the authors approached the study as more descriptive. EDE scores for both groups improved, but changes were not significant and all participants still met BED criteria at the end of treatment. The frequency of binge episodes significantly decreased in the ACT group (from 21.5 episodes in the past month to 3.5) but not the control group (13.7–10.9). However, there were large differences in the pre-treatment binge episode frequency between the groups that should be considered when interpreting the results (issues such as regression to the mean or drop out of more severe individuals).

There is a suggested effect for ACT across diagnoses in these few trials using a non-randomized design with a control. However, data are insufficient, only one trial found a significant interaction, analyses focused on treatment completers rather than using intent-to-treat principles and one trial did not conduct group comparisons at all.

3.5.6. Randomized control trials

Five RCTs were identified and included in the review. Three of these studies tested an ACT treatment using all 6 of the core processes (Fogelkvist et al., 2020; Parling et al., 2016; Strandskov et al., 2017), one study tested an ACT-based treatment using 4 of the 6 core processes (Duarte et al., 2017), and one study tested a Mindfulness and Acceptance-Based Treatment using three out of 6 core processes (Juarascio et al., 2021). In all five studies, ACT was associated with a significant reduction in ED symptoms, but studies varied in size and methodological rigor.

Two RCTs compared ACT treatment to a waitlist condition. Duarte et al. (2017) conducted a brief low-intensity intervention for BED in which the authors identified 4 ACT processes: acceptance, present moment awareness, values, and commitment. The intervention consisted of one 2.5 h group session followed by four weeks of mindfulness and compassionate imagery exercises accessed via a webpage. The intervention group ($n = 11$) had significant reduction in binge eating symptoms compared to the waitlist group ($n = 9$) and clinically significant changes in the EDE. Another study by Strandskov et al. (2017)

compared an internet-based ACT treatment with a waitlist control for individuals with BN and eating disorder not otherwise specified. Intent-to-treat analysis showed that the treatment group ($n = 46$) had a significant reduction in ED symptoms compared to the waitlist group ($n = 46$), and that 36.6% of the treatment group made clinically significant improvements compared to 7.1% of the waitlist group.

Two RCTs compared ACT to TAU. Parling et al. (2016) conducted an RCT of ACT with a five-year follow-up for individuals with AN recently completing day-care treatment at a specialized ED unit. Both groups had significantly decreased ED symptoms at post and follow-up assessments. Although the ACT group ($n = 24$) did not significantly differ in recovery status from the TAU group ($n = 19$), the odds ratio indicated that individuals who received ACT were more likely to reach a good outcome ($BMI \geq 19$ and EDE-Q global score ≤ 2.83) at post-treatment and follow-up. More recently, Fogelkvist et al. (2020) tested ACT for individuals with residual ED symptoms undergoing treatment at a specialized outpatient ED clinic. They found that the addition of ACT (12-weekly 2-h group sessions plus two individual sessions) was superior to TAU. At the two-year follow-up, the ACT group had a significantly greater reduction in ED symptoms than the TAU group. In addition, participants in the ACT group had consumed less health care and were receiving less specialized ED treatment during the follow-up phase.

One RCT compared ACT to an alternative treatment. Juarascio et al. (2021) compared a Mindfulness and Acceptance Based Treatment to CBT for 44 adults with bulimia-spectrum disorders. The acceptance-based treatment included distress tolerance/willingness to experience discomfort, mindful awareness, and committed action to values. After 20 sessions of outpatient therapy, both treatment groups had large improvements in ED symptoms (decreased frequency of binge episodes and lower EDE scores) which were maintained for both groups at 6-month follow up.

Of the RCTs, which offer the greatest methodological rigor, two of five studies (Fogelkvist et al., 2020; Strandskov et al., 2017) used an ITT analysis and found a significant Group by Time interaction in favor of the ACT group. The studies reported similar effect sizes for improvement in EDE-Q scores (Cohen's d s were medium by convention) for mixed samples (AN and BN spectrum and BN and ED NOS). While promising, these studies received a weak score for selection bias and blinding. Duarte et al., 2017 did not use ITT principles, but did find an interaction in favor of ACT. Parling et al. (which was only weak in blinding) did not find a Group by Time interaction (both groups improved).

4. Discussion

ACT is increasingly employed with EDs. The current study conducted a systematic review of the evidence for ACT with EDs. The current review takes the perspective that scientific knowledge is cumulative and iterative and informed by a variety of research methods, and thus was intentionally inclusive, reporting on case studies and/or series, multiple baseline designs and other controlled designs, as well as RCTs.

Evidence from uncontrolled trials suggest that ACT is feasible to implement with a variety of ED clinical presentations and with adolescents as well as adults across treatment settings.

A review of controlled study outcomes suggests ACT may possibly be efficacious for EDs, with several studies reporting clinically meaningful changes in ED symptoms. Reduced care consumption was also reported in the three RCTs that investigated this variable: ACT participants consumed less care than TAU participants 2 years out (Fogelkvist et al., 2020), and had fewer psychiatric visits (Parling et al., 2016) and fewer re-hospitalizations (Juarascio et al., 2013). However, there are few RCTs and concerns regarding methodological rigor across all studies, particularly as related to selection bias and blinding. Weak selection bias scores were most often due to individuals self-referring or lower rates of agreement to participate among those invited. Thus, the outcomes of these studies may be outcomes specifically among treatment seeking samples. Weak blinding scores were often due to a lack of information of

who administered the assessments and the use of self-report. Participants were also never unaware of the research question or their assigned condition, which may have influenced their reports.

Given the limited studies examining ACT with individuals with EDs, we did not organize findings along diagnostic profiles, but instead focused on the methodology and quality of the evidence. This is sensible given that diagnostic crossover is common in EDs (Castellini et al., 2011) and ACT is explicitly transdiagnostic (Twohig, Levin, & Ong, 2021). However, it may also be useful to consider how ACT fares across ED diagnosis, given knowledge to date. Of note, the majority of studies have been conducted with AN and BED, with fewer specifically examining BN or purging disorder.

While there are the largest number of studies investigating ACT for AN-spectrum ($n = 10$), there is only one RCT specific to this patient population (although they are included in studies using a mixed clinical sample). This may be because of the rarity of AN and that they may be less likely to seek treatment given the ego-syntonic nature of the clinical presentation (Treasure et al., 2020). Studies of ACT with individuals with AN showed treatment corresponded with clinically meaningful improvement in BMI and ED symptomatology among the majority of participants. Only one study did not show consistent overall improvements in BMI. This was a case series with three adults struggling with previously unremitted AN (Berman et al., 2009), and while BMI did not change significantly in two of three participants, it also did not further deteriorate. Stopping further deterioration may be a goal with adults with a more protracted course, with some choosing a palliative care approach in some cases. Clearly there is interest in ACT for AN, and given the limited treatment options, particularly among adults with AN, worth additional exploration. Preliminary evidence suggests it is feasible to implement and may potentially be efficacious; however, more well-controlled studies are needed.

ACT has also been used to treat BED with some frequency ($n = 6$), and with relatively greater experimental control, but other analytic weaknesses. Both an RCT and a CCT found that ACT resulted in greater reductions in binge eating and ED symptomatology relative to a wait-list control group (Duarte et al., 2017; Pinto-Gouveia et al., 2017) (but neither used ITT analyses). Another CCT found that ACT (and not a support group), resulted in significant decreases in binge eating frequency, but this study had a very small sample size (total analyzed $n = 15$) and was more descriptive (Corazon et al., 2018). Taken together, these data suggest that ACT may be effective in reducing binge eating and ED symptomatology among individuals who complete treatment for BED, but while relatively more robust than the AN literature, additional well-controlled studies are needed.

Only one study targeted BN-spectrum diagnoses and this was an RCT (Juarascio et al., 2021). However, several other studies utilized a mixed sample with strong BN-representation (i.e., Juarascio et al., 2013; Strandskov et al., 2017; Merwin et al., 2021). In the RCT, ACT-based treatment was compared to traditional CBT. Significant and comparable reductions in binge eating, compensatory behaviors and ED symptomatology were observed (Juarascio et al., 2021). Thus, while preliminary, data support additional exploration of ACT as a possibly efficacious alternative treatment for BN.

Purging disorder, currently listed as an example under other specified feeding and eating disorders, was the focus of only one case study. This study found ACT was effective in reducing purging in a young adult female.

While the current review supports the continued exploration of ACT for EDs, with clinically meaningful improvements corresponding with treatment, it also highlights some significant limitations in the ACT for ED research. As mentioned previously, there is a significant need for more RCTs and it is essential that studies increase methodological rigor.

The current review also highlights the limitation of study quality assessments such as the EPHPP. Most studies included in the review were given a weak global rating using the EPHPP, primarily due to inadequate control of selection bias and blinding. While these are

important areas to strengthen in future research, this result also brings attention to the challenge of using a study quality rating system developed for drug trials in psychotherapy research. For example, in many cases it is not possible to blind participants to the treatment, as is possible in a drug trial with a placebo, and by its nature, individuals' self-selection is an inescapable reality of psychological interventions that will impact outcomes. It is also notable that when using this quality measure, studies that incorporate additional assessments after end-of-treatment or longer follow-up periods may actually be penalized on the "withdrawals and dropouts" component score, as it is more challenging to retain subjects over long periods of time. This penalty occurs despite longer follow-up being an overall strength of these studies. This might deter researchers from tracking participants over longer periods of time, essential for understanding the stability of treatment effects.

The limitations of study quality assessments such as the EPHPP are also highlighted by studies in this review receiving consistently strong ratings in some of the categories. For example, most of the studies included in this review received high ratings for "data collection method" because they used self-report measures that are reliable and valid for the purposes in which they were used. However, studies over-relied on self-report measures and this is a significant limitation in clinical research that may be overlooked with tools such as the EPHPP. Direct measurements were limited to weight/BMI, with only two studies (Juarascio et al., 2013; Plasencia et al., 2019) directly measuring change in behavior (e.g., increased consumption of feared food). In general, direct observations of participant behavior (e.g., behavioral approach tasks or other lab based-assessments and in-session coding systems) are underutilized.

4.1. Call to action/recommendations

We need stronger, better studies on ACT for EDs, otherwise, we risk this work not going forward and not benefitting individuals in need. This may be particularly true for AN given the lack of empirically supported treatments for adults and risk for a chronic and unremitting course of illness making this a priority area of research. Almost half of the studies reviewed investigated ACT for the AN-spectrum, but only one of these was an RCT.

While case series and single arm studies are essential in early treatment development to determine acceptability and feasibility, whenever possible, even these small studies should minimally include a waitlist or case control or use a multiple baseline design (MBD). ITT analyses should be used whenever possible, and for MBD, Bayesian statistics should be employed.

Some methodological issues are inevitable in ED treatment. For example, it is unlikely that the sample will be drawn from a comprehensive registry of affected individuals. However, investigators should avoid recruiting and enrolling in a systematic manner that may create cohort effects or other problems in selection bias. They should also be careful to collect and report complete information on invited individuals who declined and reasons for declining (missing in some reports). Studies should do a better job of blinding assessors, while this may be due to limited resources (to hire and train additional staff), it should be prioritized. Additional efforts should also be made to prevent individuals from being lost to contact for follow up assessments, which contributes to weak scoring for withdrawals and dropout. Reasons for withdrawals and drop outs should also be clearly specified and included in the manuscript, which will help further clarify for whom treatment is acceptable and effective.

While EPHPP does not make a distinction regarding data sources, as long as reliable and valid for the purposes in which it is used, it is time for less reliance on self-report measures and more attention to processes of change. Indeed, technology and the field has developed in a way that allows for more experience and behavioral sampling and high density longitudinal measurement in real time.

Finally, the field is increasingly aware of our overreliance on White

samples. ACT for ED studies similarly suffer limited diversity, with ethnic/racial minorities underrepresented. The research identifying risk factors has also been conducted predominantly with White samples, and some evidence suggests that White individuals may seek treatment for EDs more often (Rodgers, Berry, & Franko, 2018), but this may reflect other socio-cultural context variables rather than prevalence or need. ACT for ED studies should do a better job obtaining representative samples of affected individuals.

4.2. Additional recommendations related specifically to the CBS Task Force Report

The Association for Contextual Behavioral Science recently released a Task Force Report on the Strategies and Tactics of Contextual Behavioral Science (CBS) research which defined high quality CBS research as: multi-level, multi-dimensional, process-oriented, prosocial and practical (Hayes et al., 2021). Some of the issues raised above are addressed in that report, including the need to decrease reliance on self-report and focus on process measurement.

Most of the studies included in this review include process of change measures (assessing psychological flexibility; Stockton, Kelett, Berrios, Sirois, Wilkenson & Miles 2019), but often described these measures as secondary outcomes due to an inability to formally test as mediators. In some cases, the process measures were taken too infrequently to determine influence. Future studies should employ more frequent and direct measurement, including for example, ongoing passive data collection via sensors and ecological momentary assessment (EMA).

Processes of change measurement also needs to be at the individual rather than group level to identify which component process to target with which individuals under what conditions. This will be increasingly relevant as the field moves toward process-based CBT, and facilitated with advanced statistical approaches, in which it is possible to quantify the effects of interventions in single case experimental designs and examine dynamic relationships among variables with system network analyses (Hofmann, Curtiss, & Hayes, 2020).

Regarding the multilevel aspect of CBS research, we note that most of the research on ACT for EDs is at the psychological level, with an occasional inclusion of the social context of the family or caregiver, or broad sociocultural influences (although they do not deal adequately with race or ethnicity as a contextual variable). To date, ACT for EDs has also not assessed or been tailored to lower levels of analysis (events nested within the individual; neurobiology, etc.), despite an emphasis in the ED field on constructs such as temperament (Atiye, Miettunen, & Raevuori-Helkamaa, 2014), neurocognition (Smith, Mason, Johnson, Lavender, & Wonderlich, 2018), reward pathways (Kaye, Wagner, Fudge, & Paulus, 2011) etc. While most studies use multi-dimensional assessments (assessing thinking, feeling, behavior, motivational systems), more could be done to capture dimensions at different levels of analysis, e.g., working in multi-disciplinary teams to integrate more basic findings with behavioral change research. For example, this might include tracking change in neurobiological correlates of adaptive self-regulation or similar functional dimensions.

Further, the CBS Task Force Report emphasizes the need for research to go beyond group averages to specify individual trajectories – a task that requires multiple observations nested within individuals within groups. These assessment strategies could be embedded in RCTs.

RCTs could also make greater use of adaptive designs to better identify individual treatment response (see Nahum-Shani et al., 2012 for an overview and Grilo et al., 2020 for an example using BED). In fact, this approach might increase the feasibility of conducting an RCT, which are important for an evidence base, by reducing necessary resources (identifying and focusing only on patients who are most likely to benefit, modifying the allocation of participants to trial arms, or stopping an ineffective trial arm early). Micro-randomized designs might also be considered to examine and optimize a treatment on the individual level (particularly mobile interventions) (Klasnja, Hekler, Shiffman, Boruvka,

Almirall, et al., 2015; Kroska et al., 2020) and could be used to help determine more nuanced differences in the acceptability or efficacy of different interventions.

4.3. Limitations

This review had limitations. One author performed the literature search, and while clear inclusion criteria were used, this could have influenced study selection. This review used two databases, one focused on psychological research (PsycINFO) and one focused on medical research in general (PubMed), with the rationale that these databases would have clinical outcome studies relevant to the review; however, other databases may have relevant studies not identified in our search. Another limitation is possible publication bias, due to only published and peer-reviewed studies being included. This review focused on only a subset of feeding and eating disorders. Future reviews might be more expansive or review along individual symptoms (e.g., restrictive eating, binge eating).

In conclusion, the current review highlights that while there is considerable interest in ACT for EDs and some indicated benefit, the current evidence is weak or limited and more high quality studies are needed. The hope is that this paper calls researchers to take on the challenge to improve the literature base and treatment options for individuals affected by dangerous and debilitating EDs.

Declaration of competing interest

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