

# Effects of Cognitive-behavioral and Psychodynamic-interpersonal Treatments for Eating Disorders: a Meta-analytic Inquiry Into the Role of Patient Characteristics and Change in Eating Disorder-specific and General Psychopathology in Remission

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## Research article

**Keywords:** Eating disorders, cognitive-behavioral therapy, psychodynamic therapy, interpersonal therapy, treatment effect, psychopathology, remission, meta-analysis, regression

**Posted Date:** October 26th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-96187/v1>

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# Abstract

**Background:** Cognitive behavior therapy (CBT) and psychodynamic-interpersonal therapies (PIT) are the most used outpatient treatments for eating disorders. Knowledge about the outcomes of these therapies in terms of remission is limited. Also, there is a lack of knowledge about how different therapeutic changes and patient characteristic affects outcomes.

**Method:** Reports on the effects of CBT and PIT for eating disorders were searched. Rates of remission and changes in eating disorder specific and general psychopathology were computed and meta-analytically synthesized. Regression models were made to predict summary event rates by patient characteristics and changes in specific and general psychopathology.

**Results:** Only CBT produced remission rates (34.2%) significantly different from waitlist conditions, and only CBT led to significantly greater change in specific psychopathology than waitlist/nutritional counseling conditions. However, CBT and PIT were equally effective in changing general psychopathology. For CBT, change in specific psychopathology predicted remission only when controlling for differences between diagnostic categories. Change in general psychopathology predicted remission only for PIT. The presence of comorbid personality disorder decreased the effect of CBT.

**Conclusions:** A group of patients with eating disorders may require therapy aimed at strengthening deficits in self functions not easily ameliorable by cognitive behavioral techniques alone. However, although effective in changing specific and general psychopathology, PIT is not effective in producing behavioral change. Further research should be aimed at identifying treatment interventions that effectuate both behavioral change and strengthening self-functions to substitute eating-disordered behavior to meet psychological needs in the long-term.

## Plain English Summary

To help people with eating disorders recover it is important to know what makes therapies effective or not. Therefore, we summarized the effects of two common therapies for eating disorders, cognitive behavior therapy (CBT) and psychodynamic-interpersonal therapy (PIT) and examined how different therapeutic changes could promote recovery. We found that CBT was most effective, with 1/3 of patients recovering. However, in CBT, changing the patients' thoughts about their appearance and food or their depressive or anxious feelings was not sufficient to effectuate recovery. PIT, on the other hand was not on average effective in helping patients recover. It was however effective in improving patients feeling of depression and anxiety, and for those who did recover from their eating disorder with this therapy, this was an important contribution. We discuss why this may be and suggest that CBT may be more effective because it manages to engage a subgroup of patients who are motivated to change and are less depressed or anxious. We conclude that CBT may be necessary to help people recover from eating disorders, and that PIT may help patients who also have problems with anxiety and depression.

## Background

Eating disorders (EDs) are multifaceted psychiatric disorders that bring about several aspects to psychotherapy that complicate the process of recovery. Rates of dropout from treatment range from 20% to 73%, and patients often have chronic courses of illness (1, 2). EDs are associated with several medical complications (3), and increased mortality (4). There are different theoretical understandings of EDs, pertaining to their etiology and maintaining factors, and thus how best to address the difficulties patients face in treatment.

The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5; (5) recognizes three different EDs; anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED). These diagnostic categories are intended to reflect independent manifestations of EDs, relating to the expression and severity of diagnose-specific core cognitions and behavior. The core cognitions are characterized by over-evaluation, of body weight, shape and eating. Eating-disordered behaviors are aimed at controlling body weight, shape and eating, and include subjective or objective episodes of binge-eating, dietary restriction, and compensatory strategies such as laxative use, vomiting and excessive exercise. In the DSM-5, AN is defined by significant weight loss following dietary restriction, lasting three months. BN is defined by compensatory behaviors and BED by uncontrolled bingeing episodes, both being present at least once a week for three months.

Furthermore, the clinical presentations of EDs are accompanied by interpersonal difficulties and psychiatric comorbidity. Personality disorders have meta-analytically been estimated to be comorbid with AN and BN in 50% of the cases (6). Also, a large comorbidity survey for EDs (7) showed high rates of comorbid disorders (depressive, anxiety and substance use) across ED diagnoses (56 % for AN, 94 % for BN and 78 % for BED). For patients with EDs, psychiatric comorbidities (8), and interpersonal difficulties, e. g. in the form of excessive social dominance, coldness, self-sacrifice or non-assertiveness (9) are associated with poor outcomes of psychotherapy, and persistence of eating-disordered symptoms.

Two historically prominent theoretical frameworks for understanding the psychopathology present in EDs are (a) The cognitive-behavioral model, adapted to the symptomatology and clinical presentations of EDs (10, 11) and (b) The psychodynamic (12) or interpersonal (13) models converging on the emphasis of the role of others in the development of the self, and relating psychopathology to a developmentally based deficit in self-functions. Regarding the treatment of EDs, these two traditions are distinguished by the extent to which they target eating-disordered cognitions and behaviors - what makes EDs special, or aspects of self-functions that are pertinent to all psychiatric disorders. The focus of this meta analytic review was the treatment effects of these theoretically different treatment approaches.

In line with the transdiagnostic cognitive-behavioral model of EDs (11), all eating disordered behaviors are assumed to be driven by the core eating-disordered cognitions, i.e., the over-evaluation of shape and weight, and their control. For patients with EDs, self-evaluation is based largely on the extent to which they can control their shape and weight. The cognitive and behavioral traits are assumed to be mutually reinforcing and self-perpetuating maintaining mechanisms seen in AN, BN and BED (11). Cognitive behavioral therapies aim to break the cognitive triangle consisting of thoughts, emotions and behavior by means of cognitive restructuring, and actively altering behavioral patterns (14, 15). By simultaneously challenging the specific psychopathology of EDs and deciding not to engage in eating-disordered behaviors, the cognitive-behavioral links that maintain the disorders are gradually dissolved.

On the other hand, EDs can be regarded as disorders of the self. Psychodynamic and interpersonal theories have emphasized that deficiencies in self-cohesion, self-worth and self-agency challenges a person's ability to contain emotional experiences and needs as real and legitimate, and understanding the affective, motivational and cognitive states of the self and others (16-18). Manifestations of these deficiencies may include emotion dysregulation, interpersonal difficulties (19) and eating disordered behavior (20, 21). In people with EDs deficient self-functioning has been associated with general psychopathology such as anxious and depressive features (22, 23). Eating disordered behaviors have been found to be effective strategies for regulating emotions (24) interpersonal relations and sense of self-worth and -agency (25, 26). Experienced emotional distress may thus be an important maintaining factor, linking deficiency in the patient's self-functions with the specific cognitive and behavioral features of EDs. The aim of psychodynamic-interpersonal therapy is to heighten the patient's awareness, acceptance, and tolerance of affective and motivational experiences. Furthermore, the aim is to help the patient to integrate and contain previously disavowed affective and motivational content into her sense of self (12).

The National Collaborating Centre for Mental Health (27) recommends outpatient psychotherapy as a first-line treatment for EDs. Symptom-focused CBT is recommended for AN, BN and BED. For AN, it is also recommended using psychodynamic or interpersonal therapy approaches, but no specific therapy is recommended over another.

Some meta-analytic evidence has been found for specific treatment effects for CBT relative to other treatments. CBT has demonstrated effectiveness in reducing eating-disordered cognitions (28) depressive symptoms (29) and increasing quality of life (30). Furthermore, reduction of ED psychopathology predicted the reduction of behavioral symptoms for BN and BED samples (28), and reduction of binge/purge symptoms have been found to predict greater reduction of depressive symptoms in BN samples receiving CBT, compared to other treatments (29). These findings lend preliminary support for the cognitive-behavioral model of EDs, and thus the core behavioral and cognitive symptoms as principal targets of therapeutic interventions.

However, inferences as to the effect of different specified therapeutic approaches have been difficult to make from meta-analytic inquiries, e.g., (28-33). This difficulty is due to the often multi-modal and methodologically heterogeneous nature of the treatments under study and their comparator-treatments (e.g., different combinations of active psychotherapies, treatment as usual, or wait-list conditions). In addition, outcomes have mainly been focusing on the degree to which ED psychopathology has changed due to treatment, instead of remission. Thus, the clinical relevance of differences in treatment effects have been difficult to assess.

Rates of remission, in terms of abstinence from the core behavioral symptoms have, however, been synthesized meta-analytically for BN (34) and BED (35). For BN, the rate was 30% and for BED 45%, for all patients who started therapy. Such figures are to date missing for AN. Comparisons made between treatments included in the studies were specifically defined in terms of their therapeutic foci and yielded mixed results. Interpersonal therapy produced the highest rates of remission for BED. For BN, CBT was most effective. In a direct comparison with interpersonal therapy, CBT led to higher remission rates across ED diagnoses (36).

Knowledge is to date incomplete, as to how different psychotherapeutic foci act on different aspects of EDs, as well as the relative contributions of reduction of specific and general psychopathology to remission. Meta-analysis could inform on these issues by basing the assignment of different therapeutic interventions to treatment-arms based on their common therapeutic focus more consistently and examine their effects on different clinical features presented.

The aim of this meta-analytic review is to shed light on how two specific and conceptually different treatment approaches work for patient samples with varying presentations of EDs. Given the high rates of interpersonal problems and psychiatric comorbidity in ED presentations, it is important also to understand the extent to which changes in specific and general psychopathology influence the outcome of therapy in terms of remission. For example, anxious and depressive features often constitute a considerable part of the clinical presentations of EDs. These features may be linked to and maintain the symptoms. The specific and the general psychopathology may also respond differently to different therapeutic approaches. Thus, knowing the way in which these treatment targets are altered by specific psychotherapeutic approaches would help inform which treatment construct to target and how to target them. To this end we raise three research questions:

1. Do CBT and psychodynamic-interpersonal therapies differ in treatment efficacy, and what are their respective effects with regards to remission, and change in specific and general psychopathology?
2. To what extent are rates of remission, for each of the two treatment approaches, dependent upon changes in specific and general psychopathology?
3. How does patient characteristics, such as ED diagnosis, comorbid personality disorder, and mean patient age affect remission rates for each of the treatment approaches?

## Method

This meta-analytic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (37), and was submitted for pre-registration in February 2020 at the International Prospective Register of Systematic Reviews (38). All analyses were planned before the systematic searches, literature review and data extraction were performed.

## Search strategy

Electronic databases that were searched were PsycInfo, Embase, Medline, Proquest Dissertations and Theses, and Cinahl. Three search strings were constructed for “eating disorders”, “cognitive behavior therapy”, and “psychodynamic-interpersonal therapy”, respectively. The search strings representing the treatment approaches were first combined with the operator OR, then combined with the construct “eating disorder” with the operator AND. The complete search strategy is attached in appendix B.

## Study selection and data management

Reports were pooled across databases and reviewed. Data from included studies were extracted by the two authors independently. As EDs first was included as an independent chapter in DSM-3 in 1980, records older than 1980 were excluded. A pilot-review was conducted to ensure inter-rater agreement on the extracted data. Discrepancy was solved by discussion. When calculating effect sizes, data based on intention to treat analyses were prioritized over data based on completers analysis.

## Eligibility criteria

During screening, all references to original clinical trials on the treatment of EDs were considered for full text review. To be considered eligible for final inclusion, the reports had to provide information to calculate a between-group or within-groups effect size for the proportion of patients in remission, or changes in specific or general psychopathology across at least two time-points; for at least one psychotherapeutic intervention that had a cognitive-behavioral focus or a psychodynamic-interpersonal focus; directed to outpatients with a clinical ED. Waitlist/nutritional counseling (WL/NC) conditions were included if present in reports that met other inclusion criteria.

Exclusion criteria in the full-text review were multimodal therapies combining, e.g., milieu therapy, medication, exercise; treatments combining aspects of CBT and PIT; interventions not targeting the cognitive or psychodynamic-interpersonal aspects of EDs, e.g., exposure and response prevention, dietary advice or specialist supportive clinical management; and treatments broader in scope than CBT or PIT, e.g., dialectical behavior therapy, and acceptance and commitment therapy.

## Data extraction and coding

**Outcome variables.** All outcome variables were coded across two time-points: Pre-treatment (t0) and 12 months follow-up (t1). Because relapse rates are high for EDs, 12 months follow up was used to assess treatment effects that can be said to be stable over time. If outcome assessments were available for several time-points after the end of treatment, the time-point closest to 12 months was prioritized. If follow-up assessment was unavailable, end of treatment assessment was used and coded as 0.

The number of patients intended to be treated at t0, and the number of patients in remission at t1 were extracted. For the continuous outcomes, standardized between group and within group changes in the form of Cohen's *d*, were computed based on means and standard deviations at t0 and t1, or from correlations or p-values for pre-post changes. Computing Cohen's *d*, the correlation between the pre and post measures were set to .70, which is considered sufficiently close to the test-retest reliability of many psychometric scales (39).

**Primary outcome variable.** Remission was defined as the proportion of patients in the treated sample that has undergone weight normalization (AN-samples), cessation of compensatory behaviors (AN- and BN-samples), and cessation of bingeing at t1 (BN- and BED-samples).

**Secondary outcome variables.** Furthermore, two secondary outcome variables were coded. First, specific psychopathology was coded for t0 and t1. Scales such as the Eating Disorder Examination (EDE) were preferred if primary studies reported several measures. These instruments consist of the subscales; restraint, eating concerns, shape concerns, and weight concerns, assumed to encompass the specific psychopathology. In studies where other instruments were used for measuring specific psychopathology, each subscale was evaluated in terms of relevance to its core features. Second, change in general psychopathology from t0 to t1 was quantified using assessment scales for depressive (e.g., BDI, HAM-D) or anxious (e.g., STAI-S, STAI-T, HAM-A) symptomatology. In cases where several subscales were reported, composite change scores were made from subscale scores measuring specific or general psychopathology. Each sample contributed only with one effect size per outcome measure.

**Predictor variables.** Treatment approaches were coded categorically as either cognitive-behavioral therapy or psychodynamic-interpersonal therapy. The CBT approach was included and coded based on the focus on dysfunctional thoughts, beliefs and attitudes regarding eating, body shape and weight, and how these relate to behavior and emotions. The PIT approach was included and coded according to the definition by Blagys & Hilsenroth (40).

Standardized change scores for specific and general psychopathology were also used as predictors of remission in the analyses.

Three patient variables/moderator variables were coded. First, ED diagnosis was coded as either AN, BN, BED, or mixed samples. Second, personality disorder was coded as the number of patients in the treated sample with a personality disorder diagnosis. Third, mean patient age was coded as a continuous variable.

**Additional study-level predictors.** To examine the potential moderating role of follow-up time on treatment effect, the number of months from end of treatment to follow up was coded as a continuous variable. This variable will allow an assessment of the stability of treatment effects over time.

## Data synthesis and meta-analysis

Meta analyses were performed by using the Comprehensive Meta-Analysis Software version 3. All meta-analytic models were constructed with effect sizes weighted by their inverse variance, assuming random effects, as is recommended when the true treatment effects reported by studies are expected to vary (41).

To answer question 1, computation of main effects of treatment approach were planned in separate between- and within-groups analyses. Synthesis of between-group effect sizes were planned for the relative effects of CBT and PIT versus WL/NC in direct comparisons using odds ratios for remission and Cohen's *d* for standardized differences in changes in specific and general psychopathology. Within-group summary effect sizes were calculated for individual treatment arms where CBT, PIT or WL/NC were delivered, using event rates for remission and Cohen's *d* for pre-post

changes in psychopathology. Because effect sizes were derived from studies with different designs and patient samples, significant statistical heterogeneity was expected and subjected to examination.

To answer question 2, the impact of change in specific and general psychopathology on remission was assessed. The values of change scores were centered as is recommended for continuous variables used in multiple regression with categorical variables (42). Regression models were made for each treatment approach, where remission rates were independently predicted by change scores. Additional regression models were planned to test whether treatment effects for remission were mediated by change in specific and general psychopathology, according to the model proposed by Baron & Kenny (43). Furthermore, the relative importance of each hypothesized mediator was examined by comparing their respective regression coefficients, the variance explained by, and significance of the addition of this variable to the model.

To answer question 3, regression analyses of remission on patient-characteristics (ED diagnosis, age and comorbidity), for each treatment approach were performed. The strength and direction of relationships, significance-levels, as well as variance explained by the models were examined. Regression analyses of remission rates on treatment approach and patient variables as simultaneous predictors were planned.

Furthermore, analyses were performed to assess the possible significance of design characteristics, i.e., follow-up time and allocation to treatment conditions.

## Publication bias assessment

One vulnerability of meta-analyses is the potential presence of publication bias, i.e., if studies with weak or non-significant effects are not published and therefore not included in the analysis. Publication bias has been identified as a problem in both psychological and medical research (44) but is unreliable to test with one method only. The use of several methods is therefore recommended (45). To test for publication bias, we used funnel plots to visually assess the presence of publication bias and Egger's regression for examining correlations between sample size and estimated effect sizes. Using the Duvall and Tweedie's Trim and fill method for imputing missing studies, the adjusted effect sizes for the CBT, PIT and WL/NC conditions will be examined for all outcomes.

## Results

### Study characteristics

Figure 1 displays the results from the systematic literature searches and the following review process. Table E1-E4 in appendix E contains complete descriptions of characteristics for all included studies, and a complete reference list of included studies is attached in appendix A. After removal of irrelevant reference types (e.g., qualitative studies, books, reviews, comments, editorials, and papers in other languages than English). 3111 references were screened for eligibility. After full text review, 109 studies, with 153 samples met the inclusion criteria.

Definitions of remission varied in the sample of studies. A post-hoc decision was made to include only studies that reported remission as abstinence bingeing and compensatory behavior for 28 days (for BN/BED); or weight restoration to a minimum BMI of 17.5 (for AN).

### Treatment effects

**Direct comparisons.** Eight studies met inclusion criteria for direct comparisons of CBT ( $k = 5$ ) or PIT ( $k = 3$ ) to waitlist/nutritional counseling conditions. However, because comparisons could not be made across similar outcomes,

direct comparison analyses were not performed.

**Indirect comparisons.** Table 1 shows treatment effects for primary and secondary outcome variables. Rates of remission ( $k = 81$ ) were significantly predicted by treatment approach ( $Q(2) = 14.25, p < .001$ ). Remission rates for the CBT condition were significantly higher compared to WL and PIT. However, PIT was not significantly different from WL. Weighted, averaged remission rates were 34.2 % for CBT ( $k = 66$ ), 21.6 % for PIT ( $k = 10$ ) and 15.9 % for WL/NC ( $k = 5$ ). The within-group heterogeneity was significant ( $Q(78) = 320.46, p < .001$ ). The amount of variance explained by the model, indicated by  $R^2$  analog, was 9 %.

<b>Table 1</b>					
<i>Effect Sizes for Primary and Secondary Outcomes by Treatment Condition.</i>					
Remission					
			95% CI		
	<i>k</i>	Event rate	Lower	Upper	$\hat{p}$
CBT	66	.342	.308	.377	77 %
PIT	10	.216	.153	.297	66 %
WL/NC	5	.159	.087	.275	64 %
Specific Change					
			95% CI		
	<i>k</i>	Standard difference means	Lower	Upper	$\hat{p}$
CBT	80	-.940	-1.039	-.840	91 %
PIT	15	-.737	-.971	-.502	85 %
WL/NC	5	-.145	-.541	.251	12 %
General Change					
			95% CI		
	<i>k</i>	Standard difference means	Lower	Upper	$\hat{p}$
CBT	68	-.700	-.772	-.627	81 %
PIT	17	-.710	-.864	-.557	67 %
WL/NC	7	-.162	-.389	.064	0 %
<i>Note.</i> $k$ = number of samples; $\hat{p}$ = the percentage of between-study heterogeneity not due to sampling error; CBT = cognitive behavior therapy; PIT = psychodynamic-interpersonal therapy; WL/NC = wait list/nutritional counseling condition.					



Changes in specific psychopathology ( $k = 100$ ) were significantly predicted by treatment condition ( $Q(2) = 15.59, p < .001$ ), with CBT differing significantly from WL/NC. There was no significant difference between CBT and PIT. The standardized differences in means were  $-.940$  for CBT ( $k = 80$ ),  $-.737$  for PIT ( $k = 15$ ) and  $-.145$  for WL ( $k = 5$ ). The within-group heterogeneity was significant ( $Q(97) = 939.73, p < .001$ ). The amount of total variance explained by the model was 5 %.

Changes in general psychopathology ( $k = 92$ ) were significantly predicted by treatment condition ( $Q(2) = 20.02, p < .001$ ). Both CBT and PIT were significantly different from WL, but there was no significant difference between CBT and PIT. The standardized differences in means were  $-.700$  for CBT ( $k = 68$ ),  $-.710$  for PIT ( $k = 17$ ) and  $-.162$  for WL ( $k = 7$ ). The within-study heterogeneity was significant ( $Q(89) = 408.08, p < .001$ ). The amount of total variance explained by the model was 15 %.

### **Meta-regression for remission on change in psychopathology**

Table 2 displays results of meta regression of logit event rates of remission on change in specific and general psychopathology. For CBT samples, remission rates were not significantly predicted by change in specific psychopathology ( $Q(1) = 3.71, p = .054$ ), leaving significant unexplained variance ( $Q(34) = 133.06, p < .001$ ). The amount of total variance explained by the model was 4 %. Remission rates were not significantly predicted by change in general psychopathology ( $Q(1) = .00, p = .946$ ), leaving significant unexplained variance ( $Q(29) = 114.43, p < .001$ ). The amount of total variance explained by the model was 0 %. Neither specific nor general change predicted remission for either of the diagnostic subgroups.

Because of nonsignificant coefficients for change in psychopathology and significant unexplained variance, the simple regression models were followed up with hierarchical regressions, testing ED-diagnosis as a potential moderator of the effect. A second regression model was made including diagnostic subgroup as a covariate. Adding diagnostic subgroups to the model, specific change significantly predicted remission ( $B = .40, p < .001$ ), and model fit was significantly increased ( $Q(3) = 42.05, p < .001$ ). The model ( $Q(4) = 48.54, p < .001$ ), explaining 70 % of the variance in remission.

A second model was also constructed for general change. Adding diagnostic subgroups to the model, general change did not significantly predict remission ( $B = .61, p = .073$ ). However, model fit significantly increased ( $Q(3) = 31.21, p < .001$ ), explaining 63 % of the variance in remission.

**Table 2**  
*Meta Regression of Logit Event Rates for Remission on Change in Psychopathology*

	Change in general psychopathology						Change in specific psychopathology					
			95 % CI		$R^2$	$p$			95 % CI		$R^2$	$p$
	$k$	$B$	Lower	Upper			$K$	$B$	Lower	Upper		
CBT	31	-.03	-.870	.812	.00	.946	36	.42	-.073	.844	.04	.054
AN	4	-.54	-2.678	1.605	.00	.623	7	1.36	-.093	2.814	.37	.067
BN	9	.97	-.074	2.015	.46	.069	8	.40	-.444	1.252	.00	.350
BED	8	.03	-1.141	1.192	.00	.965	9	.11	-.527	.750	.00	.733
Mixed	10	.73	-.624	2.082	.13	.291	12	.41	-.053	.863	.13	.083
PIT	6	2.07	.381	3.756	.67	<.05	-	-	-	-	-	-

*Note.*  $k$  = number of samples;  $B$  = unstandardized regression coefficients;  $R^2$  = variance explained;  $p$  = significance level; AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; Mixed = samples consisting of more than one ED diagnose; CBT = cognitive behavior therapy; PIT = psychodynamic-interpersonal therapy.

For PIT samples, regression of remission on specific psychopathology could not be performed due to an insufficient number of studies. Remission rates were strongly predicted by change in general psychopathology ( $k = 6$ ,  $Q(1) = 5.77$ ,  $p < .05$ ). The remaining unexplained variance was not significant ( $Q(4) = 6.54$ ,  $p = 0.162$ ). Change in general psychopathology explained 67 % of the total variance in remission, for PIT. There were not enough studies to conduct multiple regression analyses.

A formal statistical test of mediation was not performed because assumptions for mediated effects were not met for either CBT or PIT. For CBT, the purported mediators (i.e., specific- and general psychopathology) did not independently predict remission rates. For PIT, the treatment did not significantly predict remission over and above WL/NC.

### Point estimates and meta-regression for remission on patient characteristics

Table 3 displays point estimates for remission rate by treatment conditions and ED diagnosis. For CBT, ED diagnosis was a significant independent predictor of logit event rate for remission ( $Q(3) = 25.53$ ,  $p < .001$ ), explaining 29 % of total variance in remission. BED had the highest remission rates. Higher mean patient age ( $k = 56$ ) significantly predicted higher remission rates for CBT ( $B = .03$ ,  $Q(1) = 9.97$ ,  $p < .05$ ), and explained 13 % of the variance. Higher frequency of comorbid personality disorders in the sample ( $k = 7$ ) significantly predicted lower remission rates for CBT ( $B = -.02$ ,  $Q(1) = 7.90$ ,  $p < .01$ ), and explained 81 % of the total variance in remission.

For PIT, ED diagnosis did not significantly predict logit event rate for remission ( $Q(3) = 1.26$ ,  $p = .739$ ), and did not explain any of the variance. Significant weighted averaged remission rates were found for all diagnose samples ( $p < .05$ ). Mean patient age ( $k = 9$ ) did not significantly predict treatment effects of PIT ( $B = .02$ ,  $Q(1) = .28$ ,  $p = .599$ ), and did not explain any of the variance. For PIT, there was not enough studies to perform a regression analysis of comorbid personality disorder.

### Meta-regression for remission on design characteristics

Allocation to study (RCTs vs. non-RCTs) did not significantly predict logit event rate for remission ( $Q(1) = .47, b = -.102, p = .495$ ), and did not explain any of the variance. Follow-up-time did not significantly predict logit event rate for remission ( $Q(1) = 1.88, b = .010, p = .171$ ), and explained 6 % of the variance.

**Table 3**

*Point Estimates for Remission Rate by Treatment Conditions and Eating Disorder Diagnosis*

CBT					
95 % CI					
	<i>k</i>	Event rate	Lower	Upper	$\hat{\rho}$
AN	17	.33	.276	.395	77 %
BN	15	.28	.224	.339	29 %
BED	15	.50	.424	.568	0 %
Mixed	19	.30	.251	.352	83 %
PIT					
95 % CI					
	<i>k</i>	Event rate	Lower	Upper	$\hat{\rho}$
AN	3	.24	.120	.431	52 %
BN	4	.18	.092	.321	28 %
BED	2	.27	.129	.492	0 %
Mixed	1	.15	.043	.416	0 %
WL/NC					
95 % CI					
	<i>k</i>	Event rate	Lower	Upper	$\hat{\rho}$
AN	1	.10	.013	.481	0 %
BN	0	-	-	-	-
BED	4	.16	.068	.338	71 %
Mixed	0	-	-	-	-

*Note.* *k* = number of samples;  $\hat{\rho}$  = the percentage of between-study heterogeneity not due to sampling error; AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; Mixed = samples consisting of more than one ED diagnose; CBT = cognitive behavior therapy; PIT = psychodynamic-interpersonal therapy; WL/NC = wait-list/nutritional counselling condition.

## **Publication bias assessment**

Inspection of funnel plots and Eggers regression analysis indicated the presence of publication bias in the sample of studies obtained for change in specific and general psychopathology. The Duvall and Tweedies trim and fill method suggested some adjustments in effect sizes for each of the treatment conditions but adjusting for publication bias did not significantly change the relative efficacy of the treatments. For a report on publication bias assessment see Appendix E.

## **Discussion**

This meta-analysis examined three research questions: Firstly, we looked into differences in treatment effects between CBT and PIT on remission rates, and specific and general psychopathology; secondly, the predictive value of change in psychopathology for remission was investigated; and thirdly, the role of patient characteristics for remission was examined.

The results can be summarized as follows: For remission rates, only CBT differed significantly from WL/NC. Only CBT produced changes in specific psychopathology significantly greater than WL/NC. The treatments were equally effective in changing general psychopathology, with medium effect sizes. Reduction in specific psychopathology was not associated with higher rates of remission for CBT. Reduction in general psychopathology was strongly associated with higher remission rates for PIT, but not for CBT. ED diagnosis was associated with difference in remission rates only for CBT. Rates of remission for BED, BN, mixed diagnoses and AN were 50%, 28%, 30% and 33% respectively. For CBT, older age was associated with higher remission rates, and there was a strong negative relationship between remission and the proportion of patients with personality disorders. Due to an insufficient number of studies, regression analyses of remission rates on these variables could not be performed for PIT.

### **Treatment effects of CBT and PIT for remission**

CBT consistently showed better treatment effect on remission than PIT. However, eating-disordered behavior persists in many patients even after receiving this treatment. The treatment effects for CBT described in this study are in line with treatment effects identified by Linardon et al. for CBT in BN (34) and BED (35) when using the same criteria for remission (i.e., 28 days abstinence from bingeing and purging). The present study is, however, the first meta-analytic estimation of the proportion of patients with AN achieving weight restoration in outpatient samples receiving pure psychotherapeutic treatment.

### **The role of change in psychopathology for remission in CBT and PIT**

For CBT, change in specific psychopathology only emerged as a significant predictor of remission when controlling for differences between diagnoses. Such a finding contrasts with what may be expected by symptom-focused CBT, possibly implying that the maintaining mechanisms and thus relevant targets for treatment interventions may not be uniform across all ED presentations. For instance, change in specific psychopathology tended to be a more important predictor of change in AN compared to the other diagnostic subgroups, explaining 37% of the variance in remission.

Change in general psychopathology, i.e., anxious, and depressive features did not seem to be related to remission in CBT across ED diagnoses. Effects of change in general psychopathology was not significant, even when controlling for differences between ED diagnoses. For BN, however, change in general psychopathology tended to be more important than in the other diagnostic subgroups, explaining 47% of the variance.

These findings may indicate that the superior effect of CBT on the behavioral symptoms of EDs (e.g., dietary restriction, bingeing and purging) found in the present study may be conveyed through other mechanisms in the therapeutic process or be contingent on some patient factors. An important within-treatment factor predictive of good outcomes of therapy is early change in eating-disordered behavior and cognitions (47, 48). Among patient factors, higher motivation for change, fewer depressive features, fewer comorbidities and better interpersonal functioning have previously been found to predict better treatment outcomes (46). Furthermore, the cognitive flexibility needed to produce cognitive and behavioral change may be weakened due to chronic malnourishment in some patients with AN, and depressive features in BN (49). Thus, the effect of change in specific psychopathology on behavior may be contingent on neuropsychological health as well as differences in psychological functioning relating to the sense of self, e.g. motivation for change and levels of depression.

Regarding the effects of PIT, results of the present study suggest that the gradual change of specific and general psychopathology throughout the course of treatment is often not sufficient to achieve remission as defined by behavioral criteria. To the extent that PIT is effective in treating the behavioral symptoms of EDs, this effect seems to be conveyed by the reduction of general psychopathology and thereby dependence on ED symptoms for regulating relations and emotions.

### **The role of patient characteristics for remission in CBT and PIT**

For CBT, patient samples with BED achieved significantly higher remission rates than the other diagnostic groups. There was no significant difference between AN, BN and mixed sample. This finding may indicate that the objective episodes of binge eating characterizing BED are easier for the patients to abstain from than the dietary restriction and purging behavior seen in AN, BN and many of the OSFED/EDNOS presentations seen in the mixed samples group.

The present study identified a negative association between comorbid personality disorder and remission rate for CBT, perhaps pointing to difficulties engaging these patients in treatment. Some patients may experience significant ambivalence towards the prospect of change due to the ego-syntonic nature of the eating-disordered symptoms (50, 51) In patients where the sense of self is pervasively impaired (i.e., where there is significant lack of self-cohesion, and doubt in self-worth and self-efficacy), such as in patients with personality disorders (17), internal motivation to work on the behavioral aspects of the disorders may be lacking.

The association between age and increase in remission rates found for CBT may be confounded by ED diagnosis due to a consistently higher mean age among BED samples.

## **Strengths And Limitations Of The Present Study**

Only studies reporting strictly operationalized variables regarding diagnosis, treatment approach, psychopathology and remission were included in this meta-analysis. Further, only outpatient samples with a broad spectrum of eating disorders were included. This assured increased ecological validity and reduced the risk of confounding effects of multimodal interventions.

No systematic evaluation of primary study risk of bias was performed. However, measures were taken to circumvent the effect of attrition bias for remission, as effect sizes were always based on intention-to-treat samples. Furthermore, the impact of detection bias was reduced by consistently using objective criteria for remission.

The questions sought to be answered in this article were theoretically motivated and determined before starting data-collection. Such research practice is encouraged because it reduces the amount of reporting bias in the scientific literature (52).

Several features of this study may warrant caution in interpreting the results. Due to lack of randomization, both within and across studies included, this meta analytic inquiry does not demonstrate causal relationships between the variables assessed.

Furthermore, our sample of studies are characterized by a disproportionate distribution of CBT and PIT samples; CBT being more frequently represented than PIT and WL/NC. Thus, the distribution of statistical variance is skewed towards CBT, with less variance contained within the PIT and WL/NC samples. Statistical power is thereby decreased, making inferences about differences between groups of samples more prone to type 1 and type 2 error (53).

Publication bias is a prevalent phenomenon in psychological research (54). There was indeed evidence of publication bias for change in specific and general psychopathology in this meta-analysis, but not in rates of remission. Most methods for detecting publication bias do not perform well when heterogeneity in the true effect size is large as in this meta-analysis (55), and the results must therefore be interpreted with caution.

The model predicting remission by change in general psychopathology for PIT, and the one predicting remission by rate of comorbid personality disorders for CBT both indicated good model fit but were based on few studies.

### **Directions for future research**

To make PIT a legitimate treatment alternative to CBT there is a need for more knowledge about active mechanisms of change. Specifically, further research should focus on the extent to which the reduction of general psychopathology seen in PIT is sufficient to bring about satisfying rates of abstinence from eating-disordered behavior.

To achieve this knowledge, there is a need for more consistent definitions of remission and agreement on relevant outcome measures, across different treatment approaches. Studies on remission in PIT for EDs tend to use remission definitions pointing to those aspects of psychological functioning underlying eating-disordered behavior instead of behavioral definitions, as used by CBT studies. Perhaps, primary studies should use both definitions independently of treatment approach, making the outcomes possible to compare directly to each other.

## **Conclusion**

Our findings suggest that CBT consistently showed better treatment effects than PIT, indicating that a therapeutic focus on the ED specific behavior, which is characteristic for CBT may be necessary to reliably produce behavioral remission. The results of the present study confirm, however, that EDs are multifaceted psychiatric states with need for a thorough understanding about precipitating and maintaining factors. Some of the findings in this study suggest that other aspects of psychological functioning than those pertaining exclusively to ED specific cognitions and behavior may affect treatment outcomes and warrant therapeutic attention; a) the effect of change in ED psychopathology was not sufficient to explain rates of remission, b) decreased treatment effects for patients with personality disorders, and c) higher remission rates for BED than in the other ED presentations. The importance of change in general psychopathology in PIT, suggests that for some patients, improvements self-functions may be necessary to obtain remission from ED symptoms. Although the results of the present study suggest that CBT has the best effect on remission and specific psychopathology, the observations made in this study suggest that for some patients the treatment may need a wider focus, and also target aspects of the sense of self.

## **Abbreviations**

AN: Anorexia nervosa; BED: Binge eating disorder; BN: Bulimia nervosa; CBT: Cognitive behavior therapy; ED: Eating disorder; PIT; Psychodynamic-interpersonal therapy; WL/NC: Waitlist/nutritional counseling.

# Declarations

## Ethics approval and consent to participate

Not applicable.

## Consent for publication

Not applicable

## Availability of data and materials

The datasets generated and analyzed during the current study are available in the Open Science Framework repository (56), at <https://osf.io/8mynp/>

## Competing interests

The authors declare that they have no competing interests

## Funding

The article processing charge is paid for by the publication fund at UiT – The Arctic University of Norway.

## Authors' contributions

LTM developed and researched the conceptual framework and design of the study, coded, and analyzed data and wrote up the article. BS participated in developing research questions, coded, and analyzed data, participated in writing up the article, and prepared data tables. RGS reviewed drafts, helped specify research questions and planning analyses, and helped structuring the text and interpreting results. ADM reviewed drafts, suggested operational definitions of variables, and helped interpreting results.

## Acknowledgements

The authors would like to thank Torstein Låg, senior academic librarian at Department of Psychology at UiT – the Arctic university of Norway (UiT) for giving advice on search engines, reviewing the search strategy, and helping with interpretation of the results of meta-analysis; Matthias Mittner, Associate professor at the Department of Psychology at UiT gave advice on preregistration and statistical methods in the beginning of the project; and the publication fund at UiT – The arctic University of Norway for granting coverage of the processing charge for this manuscript.

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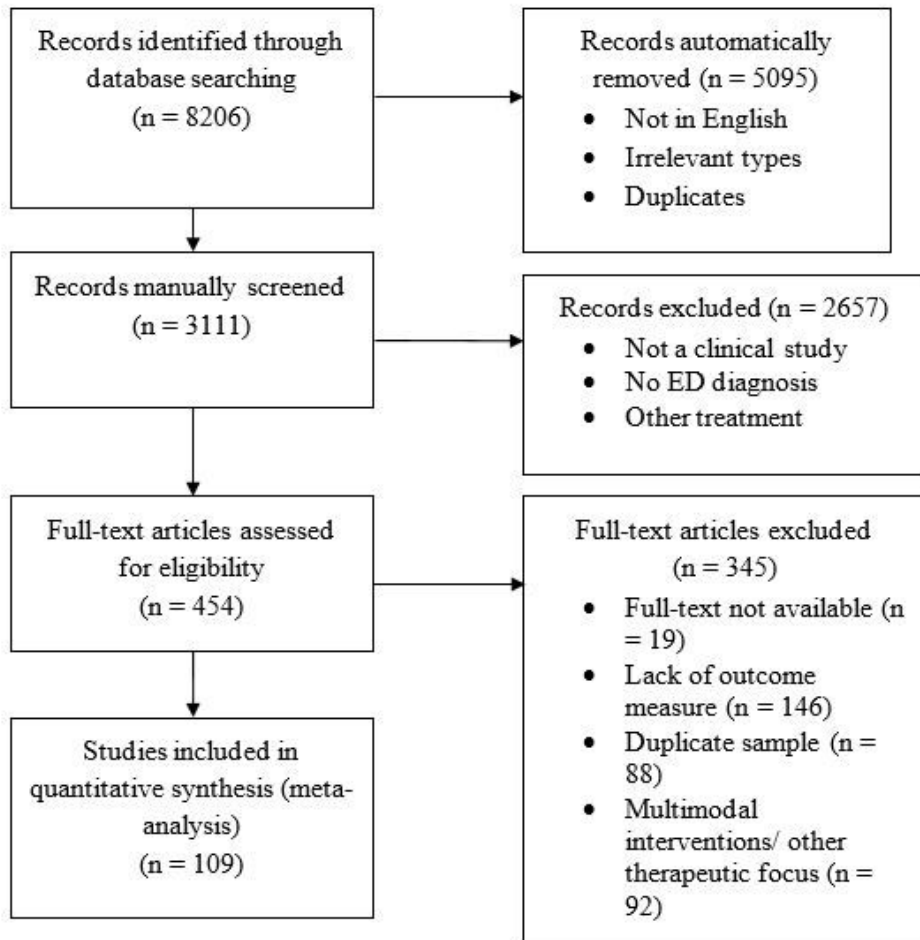
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## Figures



**Figure 1**

PRISMA flow diagram for the systematic literature review

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