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Purpose of review
Childhood maltreatment is associated with all types of eating disorders. We provide a systematic review of the recent literature on comorbid posttraumatic stress disorder (PTSD) in patients with eating disorders, and focus on prevalence, relationship with symptom severity, operating mechanisms and treatment.

Recent findings
The prevalence of comorbid PTSD in patients with eating disorders ranges from 9 to 24%, with research suggesting that comorbid PTSD is associated with more severe eating disorder symptoms. Maladaptive emotional regulation strategies may mediate the relationship between PTSD and eating disorders. Two pilot studies provide preliminary evidence that concurrent cognitive behavior therapy (CBT) for PTSD and eating disorders may be beneficial and that repetitive transcranial magnetic stimulation (rTMS) could be helpful in the treatment of PTSD in some eating disorder patients.

Summary
PTSD is a common comorbidity in patients with eating disorders and impacts the severity of their eating disorder symptoms. However, there is little research into concurrent treatments for PTSD and eating disorders. Difficulties in emotional regulation may be a common mechanism in both disorders.

Keywords
comorbidity, eating disorders, prevalence, posttraumatic stress disorder

INTRODUCTION

Patients with an eating disorder often report a history of trauma. Longitudinal and cross-sectional studies have shown that sexual abuse and other adverse experiences are common risk factors for developing eating disorders [1,2]. In a recent comprehensive meta-analysis of 82 studies, Molendijk *et al.* [3▪] examined the prevalence of childhood maltreatment in patients with eating disorders. Childhood maltreatment prevalence was high in each type of eating disorders ($N = 13\,059$, prevalence 21–59%) relative to healthy ($N = 15\,092$, prevalence 1–35%), and other psychiatric ($N = 7736$, prevalence 5–46%) control groups. Moreover, childhood maltreatment showed a dose–response relationship with all eating disorder diagnoses. Patients with eating disorders who had been exposed to childhood maltreatment had more severe eating disorders, reported more binge-purging behavior, had a higher comorbidity rate, and had an earlier onset of the eating disorders than those who had not been maltreated as a child [3▪]. In a recent observational study over a period of 3 years, it was found that patients with eating disorders who had experienced childhood maltreatment had a higher rate of psychiatric comorbidity and a lower recovery rate than those without such trauma [4].

Past research has focused mainly on the presence of childhood trauma; however, posttraumatic stress disorder (PTSD) is often overlooked [5]. PTSD is characterized by the following persisting symptoms after experiencing a traumatic event: re-experiencing the trauma, persistent avoidance of stimuli associated with the trauma, negative thoughts and feelings about the self or others, and increased arousal [6]. The lifetime prevalence of PTSD in the general population is estimated at 6.8–9.2%, depending on the nature of the traumatic event [7,8].

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KEY POINTS

- Childhood maltreatment is associated with all types of eating disorders.
- Prevalence of comorbid PTSD in patients with eating disorders ranges from 9 to 24% and has an impact on the severity of their eating disorder symptoms.
- Difficulties in emotional regulation seem to mediate the relationship between PTSD and eating disorders.
- More research on the treatment of comorbid PTSD and eating disorders is needed.

Posttreatment relapse rates are high in eating disorders and negative treatment outcomes are common, especially in anorexia nervosa [9,10]. This might be explained by the high psychiatric comorbidity [11,12]. In a literature review, Trottier and MacDonald [13] concluded that in individuals with both eating disorders and PTSD, it is common to find additional comorbidities, such as substance abuse disorders, depression, and borderline personality disorder.

Concurrent treatment of eating disorders and PTSD, therefore, seems to be promising. Guidelines on eating disorders from the Royal Australian and New Zealand College of Psychiatrists and from the National Institute for Health and Care Excellence (UK) explicitly state that it is important to screen for comorbidities and treat these accordingly [14,15]. However, the international guidelines for eating disorders [15] report little information on the co-occurrence of PTSD and eating disorders, nor do they make recommendations on how to treat them, indicating a lack of research into this phenomenon or on possible cotreatments. Here we provide an overview of the recent literature on PTSD in eating disorders, with a focus on prevalence, relationship with symptom severity, potential operating mechanisms, and treatment.

METHODS AND STUDY SELECTION

We systematically searched the PsychInfo, Medline, EMBASE databases and also checked for further publications in Google Scholar for studies published between January 2013 and May 2019 in English, Dutch, or German. The following concepts and MeSH terms were combined to screen titles and abstracts: 'Eating disorder OR anorexia nervosa OR bulimia nervosa' OR 'binge eating disorder AND Trauma OR posttraumatic stress disorder'.

The first author (C.R.) screened the resulting titles and abstracts, and applied the following four criteria to select publications for full-text evaluation: full-text, peer-reviewed article, sample of patients meeting eating disorders diagnostic criteria, use of PTSD measure, data on both eating disorders and PTSD. All four criteria had to be met to be included in the evaluation. The reference lists of these studies were examined for additional relevant studies. In addition, we required a minimum of 100 patients in the eating disorder sample for assessing the prevalence range.

We used the standardized method for evaluating primary research articles and assessing their methodological quality [16]. This method considers 14 items, with total scores ranging from 0 (no criterion is reached) to 28 (maximum score). It has a moderate-to-good inter-rater agreement [16]. The raters were the first author (C.R.) and an independent rater (Marie-Louise Kullberg, PhD Student at Leiden University, Leiden, The Netherlands) Publications were excluded if the inter-rater agreement on the study's quality was less than 0.55 [16].

RESULTS

After removing duplicates, we identified a total of 236 eligible studies, including both randomized control trials and uncontrolled, nonrandomized studies. A total of 31 studies met our screening criteria and were selected for full-text evaluation by the first author (C.R.). They were all in English. Of these, nine studies met all the inclusion criteria for this review (Fig. 1). A full description and ratings of the quality assessment can be requested from C.R.

Prevalence of posttraumatic stress disorder

Four studies [17–20] measured the prevalence of comorbid PTSD in patients with eating disorders. The prevalence ranged from 9 to 24% (Table 1). Various methods were used to assess PTSD and eating disorders: two studies used the Structured Clinical Interview for DSM (SCID-I) [17,18], one used a clinical diagnosis in combination with self-reported measures [19], and one used national patient registers that recorded clinical diagnoses based on either the *International Classification of Diseases* (ICD-9 and ICD-10) for PTSD or the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) [20]. Isomaa *et al.* [17] reported a 24.1% lifetime prevalence of PTSD in a large sample of 843 adult patients with eating disorders and a history of traumatic exposure using data from a database for specialized eating disorders care in Sweden. They found a stronger relationship between eating disorder symptoms and PTSD related to physical assault and sexual trauma than for other types of trauma.

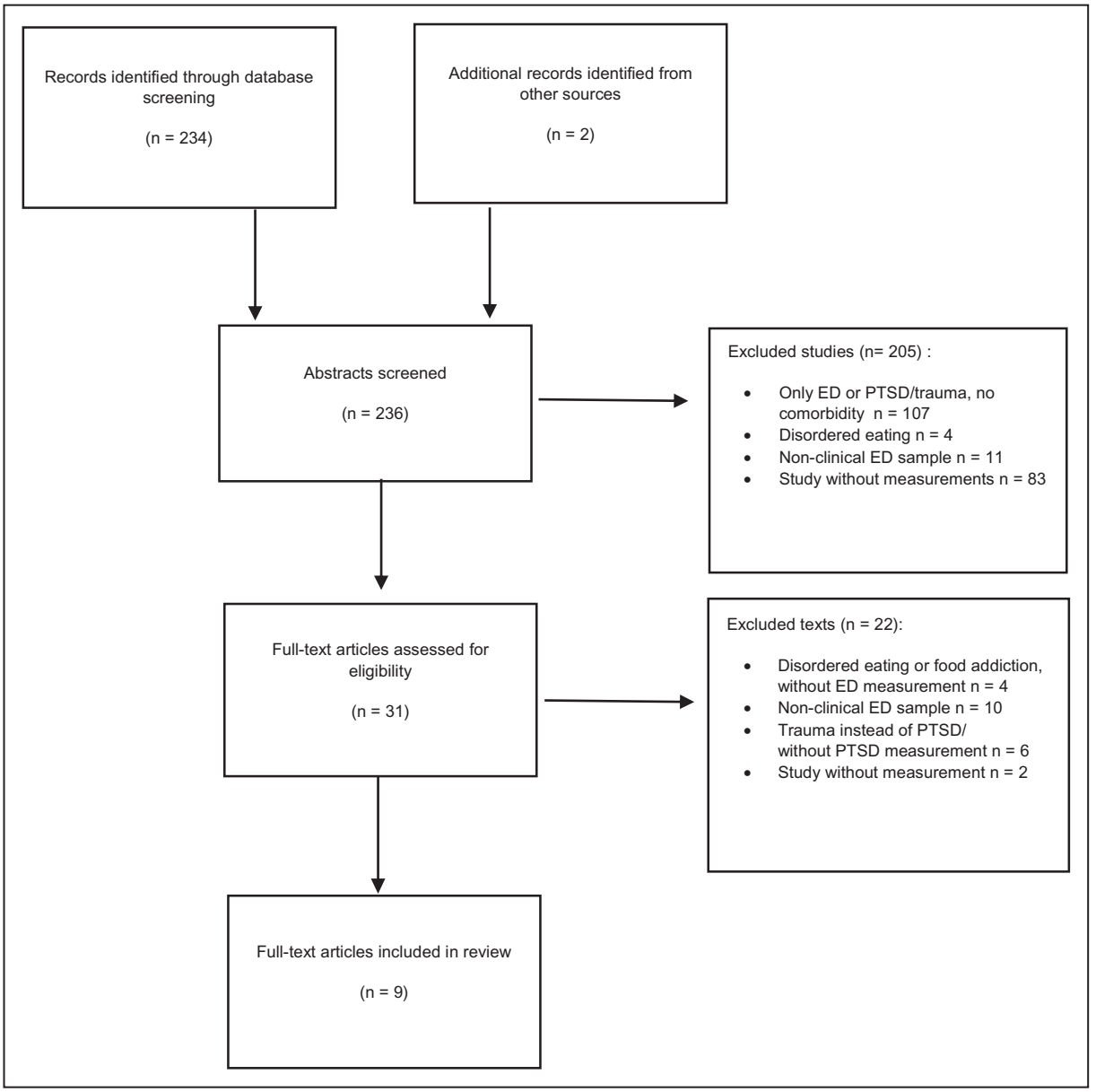

FIGURE 1. Flow diagram of inclusion of studies for this review.

Another study – using data from the Swedish National Quality Register for Eating disorders – found a lifetime prevalence for PTSD of 9.4% among a large sample of 850 patients with binge eating disorder (BED) [20].

Relationship between posttraumatic stress disorder and severity of eating disorders

Five cross-sectional studies showed an association between the severity of eating disorder pathology and comorbid PTSD symptoms [17–21] (see Table 2 for an overview). Tagay *et al.* [19] reported a positive relationship between PTSD and the severity of eating disorder symptoms in a sample of patients with anorexia nervosa and bulimia nervosa [19]. Karr *et al.* [18] used ecological momentary assessment to compare daily binging and purging in bulimia nervosa patients and in bulimia nervosa–PTSD patients. They found that co-occurring PTSD was associated with more frequent daily binging and purging. In a mixed sample of eating disorder patients, Isomaa *et al.* [17] showed that the presence of a PTSD diagnosis was related with the severity of eating disorder symptoms. This effect was mediated by psychological distress. In 21 female eating disorder inpatients (a subsample of a wider study that investigated sex differences between trauma-related symptoms and eating disorders), it was shown that this particular group of patients more often

Table 1. Prevalence of posttraumatic stress disorder and eating disorders

Authors (year) [reference no.]	Location	Participants	Prevalence PTSD	95% CI	Instruments PTSD	Instruments eating disorders
Isomaa *et al.* (2015) [17]	Sweden	819 female and 24 male mixed eating disorders, inpatients and outpatients Age 18–66 years	24.1% Lifetime prevalence	21.3–27.1%	National register DSM-IV diagnosis SCID-I LEC	National register DSM-IV diagnosis SEDI SCID-I
Karr *et al.* (2013) [18]	USA	119 female BN inpatients and outpatients, college students, general population Age 18–55 years	16.8% Point prevalence	11.2–24.5%	SCID-I	SCID-I
Tagay *et al.* (2014) [19]	Germany	103 AN ($N=52$) or BN ($N=51$) female inpatients and outpatients Age 18–68 years	AN/BN: 24.3% Lifetime prevalence AN 23.1% BN 25.5%	AN/BN: 17.0–33.4%	ETI	ICD-10 and EDI-2
Welch *et al.* (2016) [20]	Sweden	811 female and 39 male BED outpatients and inpatients Age 14–72 years	9.4% Lifetime prevalence	7.6–11.6%	National Patient Register ICD-9 (1987–1997) or ICD-10 (from 1997) diagnosis	National eating disorders quality registers DSM-IV diagnosis (structured diagnostic interview)

AN, anorexia nervosa; BN, bulimia nervosa: BED, binge eating disorder; CI, confidence interval; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; EDI, Eating Disorder Inventory; ETI, Essen Trauma Inventory; ICD, *International Classification of Diseases*; LEC, Life Events Checklist; PTSD, posttraumatic stress disorder; SCID-I, Structured Clinical Interview for DSM-IV/5; SEDI, Structured Eating Disorder Interview.

perceived that their PTSD symptoms are causing their eating disorder symptoms rather than their eating disorder symptoms causing their PTSD symptoms [21]. Levinson *et al.* [22] demonstrated that a comorbid PTSD diagnosis in 42 patients with eating disorders was associated with an increase in likelihood of food anxiety.

Operational mechanisms

The use of maladaptive emotional regulation strategies is proposed as a shared mechanism in the development of PTSD and eating disorders [5]. In the study by Karr *et al.* [18], patients with bulimia nervosa and comorbid PTSD reported more negative affect than those with only bulimia nervosa. Negative affect was scored by using specific items (e.g. 'distressed') from the short version of the Positive and Negative Affect Scale [23], with higher scores indicating a higher level of negative affect. In both groups, the experience of negative affect is increased before binges and purging, and decreased thereafter. The increase and decrease in affect before and after purging is faster in patients with comorbid PTSD and bulimia nervosa than in those with only bulimia nervosa, which suggests that a comorbid PTSD diagnosis has an effect on the relationship between purging and regulation of affect in bulimia nervosa [18]. In a recent study, Vanzhula *et al.* [24▪▪] investigated the illness pathways between PTSD and eating disorders in both a clinical sample and a nonclinical sample using network analysis. They identified three major pathways that could explain the connection between the two disorders and maintenance of the comorbidity. The strongest pathway was between the PTSD symptom 'irritability' and binge eating, thus, supporting the causal role of negative emotions. The second strongest pathway was between 'disturbing dreams' and 'desire for a flat stomach', suggesting that intrusions can activate negative thoughts about one's body shape. The third pathway identified concerned problems with concentration and memory. The authors suggest that PTSD-related impairment of concentration is likely to extend to shape-related concentration problems. Core symptoms in the PTSD-eating disorders network were binge eating, desire for flat stomach, fear of weight gain, and intrusions. The clinical and nonclinical networks did not differ in structure, but the clinical network did have a stronger connection between symptoms.

Treatment

Our search identified only two small pilot studies on the treatment of concurrent PTSD and eating

Table 2. Main outcomes

Authors (year) [reference no.]	Location	Participants	Outcome measures	Classification system	Main findings
Relationship with symptom severity/mechanism					
Isomaa *et al.* (2015) [17]	Sweden	843 mixed eating disorders inpatients and outpatients	SCID-I LEC SEDI EDE-Q CPRS-S-A	DSM-IV	The presence of a PTSD diagnosis is related with the severity of eating disorder symptoms and this effect was mediated by psychological distress
Karr *et al.* (2013) [18]	USA	119 female BN inpatients and outpatients, college students, general population	SCID-I/P PANAS	DSM-IV	Co-occurring PTSD is associated with more frequent daily binging and purging
Tagay *et al.* (2014) [19]	Germany	103 mixed eating disorders inpatients and outpatients	ETI EDI-2	DSM-IV	There is a positive relationship between PTSD and the severity of eating disorder symptoms
Thornley *et al.* (2016) [21]	Canada	21 female mixed eating disorders inpatients[a]	PCL-5 LEC-5	DSM-5	Female eating disorder patients more often perceive their PTSD symptoms are causing their eating disorder symptoms rather than their eating disorder symptoms to be causing their PTSD symptom
Levinson *et al.* (2019) [22]	Switzerland	42 mixed eating disorders outpatients	MINI SCID SUDS	DSM-IV	Eating disorder patients with comorbid PTSD are more likely to experience food anxiety
Vanzhula *et al.* (2018) [24▪▪]	USA	158 mixed eating disorders patients and 300 college students	EDDS PCL-C EDE-Q	–	Three illness pathways between PTSD and eating disorders: binge eating and irritability, desire for flat stomach, and disturbing dreams; PTSD-related concentration problems; and weight-related and shape-related concentration problems
Treatment					
Trottier *et al.* (2017) [25▪▪]	Canada	10 mixed eating disorder patients with comorbid PTSD	CAPS PCL EDE-Q	DSM-IV	Preliminary results show that integrated CBT is effective in treating eating disorders and PTSD concurrently
Woodside *et al.* (2017) [31▪]	Canada	14 mixed eating disorders patients with comorbid PTSD	PCL-C DERS	DSM-IV	DMPFC-rTMS treatment might be beneficial for patients with PTSD and eating disorders who do not respond to standard treatment

BN, bulimia nervosa; CAPS, Clinical Administered PTSD Scale; CBT, Cognitive Behavioral Therapy; CPRS-S-A, Comprehensive Psychiatric Rating Scale; DERS, Difficulties in Emotion Regulation Scale; DMPFC-rTMS, repetitive transcranial magnetic stimulation to the dorsal medial prefrontal cortex; DSM, *Diagnostic and Statistical Manual of Mental Disorders*; EDDS, Eating Disorder Diagnostic Scale; EDE-Q, Eating Disorder Examination Questionnaire; EDI, Eating Disorder Inventory; ETI, Essen Trauma Inventory; LEC, Life Events Checklist, PCL, PTSD checklist; MINI, International Neuropsychiatric Inventory; PANAS, Positive and Negative Affect Scale; PTSD, posttraumatic stress disorder; SCID, Structured Clinical Interview for DSM-IV/5; SEDI, Structured Eating Disorder Interview; SUDS, Subjective Units of Distress Scale.

[a]This article also describes a convenience general population sample recruited online, which was not formally diagnosed.

disorders (Table 2). Trottier *et al.* [25▪▪] integrated cognitive behavioral therapy (CBT) for eating disorders and PTSD into their pilot study. CBT is the treatment with the strongest evidence base for eating disorders in general [26,27]. In the study of Trottier *et al.*, 10 patients diagnosed with eating disorders (anorexia nervosa, bulimia nervosa, or other specified feeding or eating disorder) and PTSD first received intensive, hospital-based, eating disorder treatment aimed at restoring weight, establishing a regular eating pattern, and decreasing binge-purging behavior [25▪▪]. This lasted 6–8 weeks for patients who were not underweight and longer for patients who needed to gain weight. The hospital treatment was followed by 16 CBT sessions to maintain the improvement in eating disorder symptoms. After three sessions, the length of each session was extended and cognitive processing therapy for PTSD was added for the remaining 13 sessions. Before the start of the integrated treatment phase, all 10 patients showed a decrease in eating disorder symptoms. After the 16 sessions, 8/10 patients showed remission of PTSD symptoms, as measured by the Clinician-Administered PTSD Scale (CAPS) [28], and they no longer met the diagnostic criteria for PTSD. They also maintained the earlier results of their intensive hospital-based eating disorders treatment. One patient did not fill in the postmeasure of eating disorder symptoms, but did show remission of PTSD symptoms as measured by the CAPS and no longer met the diagnostic criteria for PTSD. Another patient showed a worsening of eating disorder symptoms after the integrated treatment but an improvement in PTSD symptoms, although still meeting the diagnostic criteria for PTSD diagnosis. The worsening of symptoms was thought to be because of the patient's inability to gain full control over the eating disorder symptoms during the intensive hospital phase [25▪▪].

The second pilot study on the treatment of comorbid PTSD and eating disorders investigated repetitive transcranial magnetic stimulation (rTMS), a more experimental treatment. In rTMS, a patient receives noninvasive magnetic stimulation, which is intended to cause changes in activity in the specific brain region targeted. Emerging studies on the treatment of eating disorder patients with rTMS show promising results using a design with case series or a double-blind controlled design with a sham condition [29]. In a meta-analysis on the effect of rTMS on PTSD symptoms, in general, it is concluded that rTMS may be an effective treatment, but the working mechanism remains controversial and based on very limited evidence [30]. In an open-label case series design, the effects were investigated of 20–30 sessions of rTMS on PTSD symptoms in 14 patients with both PTSD and eating disorders who were unresponsive to standard treatment [31▪]. Eight of them improved significantly, defined as a more than 50% improvement in PTSD-checklist scores. Treatment was well tolerated by all participants and no worsening of symptoms was observed [31▪].

DISCUSSION

This review provides an overview of the recent literature on PTSD in patients with eating disorders, focusing on prevalence, relationship with symptom severity, operational mechanisms, and treatment. We identified only nine studies in the period between January 2013 and May 2019 that met our inclusion criteria.

Four studies reported prevalences of PTSD in eating disorders ranging between 9 and 24%, with the lowest rate found in a large BED sample [20] and the highest rate in mixed eating disorder patient samples. In the mixed eating disorder patient samples, the prevalence of PTSD is 2.5–3.5 times higher than in the general population [7,8]. There are several explanations for the range in prevalence of PTSD in patients with eating disorders. Firstly, different diagnostic instruments were used to assess PTSD, ranging from self-reporting to a structured clinical interview. Secondly, study populations varied from inpatient to outpatient samples (with the rate of PTSD comorbidity expected to be higher in the former), and from patients with BED to mixed eating disorder samples.

Importantly, PTSD is often underdiagnosed in clinical eating disorder practice [32], whereas the negative effects of PTSD on eating disorder development and its course are clear. Therefore, we strongly recommend screening for PTSD in all eating disorder cases. The Clinician-Administered PTSD Scale (CAPS) [28], a structured clinical interview assessing PTSD criteria and symptom severity, is the gold standard for formal diagnostic assessment when patients screen positive for PTSD.

The reviewed studies also identified a positive relationship between PTSD and eating disorders, with several cross-sectional studies showing that eating disorder symptoms are more severe when there is comorbid PTSD symptomatology [17–19,22]. This is in line with findings that psychiatric comorbidity, in general, is associated with elevated severity of problems [33]. More research on the effect of comorbid PTSD diagnosis on eating disorder symptoms is needed to increase insight into the relationship between them.

We provide some evidence for a common mechanism of emotional regulation between PTSD and eating disorders [18,24▪▪]. Maladaptive emotional

regulation strategies seem to mediate this relationship. Difficulties in emotional regulation are common in eating disorders, for example, many patients experience problems in recognizing emotions [34]. PTSD is associated with heightened emotional reactivity to traumatic cues, and ineffective emotional regulation abilities are a risk factor for developing and maintaining the disorder [35,36]. PTSD symptom severity is also associated with impairment of applying functional emotional regulation strategies [35,37], and this association has been found especially in patients with childhood trauma of an interpersonal nature [38]. It is suggested that the experience of a traumatic event in childhood has a detrimental effect on the development of adaptive emotional regulation strategies [38]. However, more research is needed to investigate the bidirectional relationship between PTSD, eating disorders, and maladaptive emotional regulations.

Two pilot studies provide preliminary evidence that concurrent CBT for PTSD and eating disorders may be beneficial [25▪▪], and that rTMS could be helpful in the treatment of PTSD in some eating disorder patients [31▪]. In a survey of 184 frontline eating disorder clinicians, the majority believed that concurrent therapy is the most appropriate treatment for PTSD and eating disorder comorbidity [34]. However, they did have some concerns about carrying out PTSD treatment on patients with eating disorders. The most frequently reported concerns were a possible increase of eating disorder symptoms, self-injury, or interference with eating disorder symptoms [39]. Considering there have been so few studies published on treatment, there is an urgent need for more research into the concurrent treatment of PTSD and eating disorders.

A strength of this review is that it focusses specifically on PTSD and eating disorder comorbidity in patient populations, which makes it directly relevant to treatment. However, there is little recent literature on PTSD-eating disorder comorbidity, and thus, this review is based on only a small number of publications.

CONCLUSION

The prevalence of comorbid PTSD in eating disorders cases ranges from 9 to 24%. Several studies showed that a comorbid PTSD diagnosis is associated with the severity of eating disorder symptoms. Maladaptive emotional regulation strategies seem to mediate the relationship between PTSD and eating disorders. There are only pilot results on the treatment of the comorbidity of PTSD and eating disorders. More work is urgently needed in this field.

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Conflicts of interest

There are no conflicts of interest.

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