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Eye movement desensitization and reprocessing *versus* cognitive behavioral therapy in the treatment of inpatients with obesity, binge eating disorder, and traumatic experiences: a randomized controlled trial

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Abstract

Overweight and obesity are linked with binge eating disorder (BED). Traditionally, cognitive behavioral therapy (CBT) is the therapeutic approach indicated for both inpatient and outpatient treatment of BED. Eye movement desensitization and reprocessing (EMDR) could be more effective for the treatment of BED, in particular with patients who have experienced one or more traumatic experiences. A two-arm randomized controlled trial (RCT) was thus run to test the hypothesis that a 4-week EMDR intervention was more effective than a parallel CBT intervention in the treatment of inpatients with obesity and BED who experienced at least a traumatic event. Sample included 31 inpatients, who were randomly assigned to EMDR (n=16) or CBT (n=15). Outcomes were the reduction of binge eating symptoms, emotional eating, psychological distress, and trauma-related variables, and the improvement of emotion regulation from baseline to treatment completion. Results showed no statistically significant difference between the two treatment conditions, while statistically significant improvements were observed in the whole sample and in several outcome variables: depression, anxiety, stress, emotional eating, binge eating, two Difficulties in Emotion Regulation Scale (DERS) domains (Clarity and Strategies), and the DERS total score, two Impact of Event Scale-Revised (IES-R) sub-scales (Intrusion and Hyperarousal) and the IES-R total score, but with small standardized sizes of improvements (Cohen's d). Both interventions may have yielded similar benefits; however, the absence of a control group prevented a clear attribution of these improvements to the interventions, as all participants were concurrently undergoing a structured residential multidisciplinary treatment. Future studies should include larger samples, longer treatment protocols, and follow-up assessments, as well as comparison groups of inpatients not receiving experimental treatments, to better isolate the specific effects of EMDR and CBT.

Key words: binge eating disorder, obesity, trauma, cognitive behavioral therapy, eye movement desensitization and reprocessing.

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Introduction

Feeding and eating disorders (FEDs) have been recognized as major global health concerns (Silén & Keski-Rahkonen, 2022). FEDs include different types of disorders, such as anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED), which are all generally characterized by excessive preoccupation with body shape, eating, and weight, and may include disordered eating and compensatory behaviors.

BED is a relatively new FED introduced in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5). It is characterized by recurrent episodes of consuming unusually large amounts of food within a short period of time and with a sense of lack of control over eating, followed by a sense of guilt. In contrast to BN, binge eating episodes are not followed by compensatory behaviors such as vomiting (American Psychiatric Association, 2013).

FEDs are associated with a wide range of medical comorbidities, including cardiac, metabolic, gastrointestinal, and reproductive complications. In particular, BED is strongly associated with obesity and obesity-related disorders such as type 2 diabetes, hypertension, and dyslipidemia (Malnick & Knobler, 2006; Olguin *et al.*, 2017).

Psychiatric comorbidities are also highly prevalent among FEDs. The most frequent are anxiety disorders (particularly obses-

sive-compulsive disorder, generalized anxiety disorder, and social phobia), mood disturbances such as major depression, and alcohol and substance abuse (Godart *et al.*, 2015; Keski-Rahkonen & Mustelin, 2016; Mustelin *et al.*, 2016).

Effective treatment of FEDs requires a multidisciplinary approach, including medical, nutritional, psychological, and physical interventions. From a psychotherapeutic perspective, cognitive behavioral therapy (CBT), in particular, the enhanced cognitive behavioral therapy (CBT-E) (Grave *et al.*, 2013), has been recognized as the treatment of choice for FEDs. Although CBT-E is the most widely used intervention for FEDs, some evidence suggests limited long-term effectiveness, with high dropout rates and unsatisfactory remission levels (Atwood & Friedman, 2020). These limitations have prompted researchers to investigate the role of psychopathological mechanisms that may not be adequately addressed by CBT-E (Cassioli *et al.*, 2022), but which play a role in the onset and maintenance of FEDs.

History of trauma and early adverse life experiences such as neglect and abuse, as well as stressful events, have been identified as common risk factors for FEDs (Caslini *et al.*, 2016; Ergüney-Okumuş, 2021; Micali *et al.*, 2013; Mitchell *et al.*, 2021; Molendijk *et al.*, 2017; Monteleone *et al.*, 2018; Sachs-Ericsson *et al.*, 2012), and as predictors of poorer treatment outcomes when not properly addressed (Meneguzzo *et al.*, 2022; Monteleone *et al.*, 2021; Serra *et al.*, 2020). Because CBT-E does not specifically target trauma-related symptoms (Trottier & MacDonald, 2017), it has been hypothesized that trauma-focused approaches can be more effective in the treatment of FEDs.

Eye movement desensitization and reprocessing (EMDR) is a trauma-focused therapy developed by Shapiro in 1987 for the treatment of post-traumatic stress disorder (PTSD) and traumatic psychopathological features, such as dissociation (Atchley & Bedford, 2021). Several systematic reviews and meta-analyses (Van Minnen *et al.*, 2016; Wilson *et al.*, 2018) have confirmed that EMDR is effective in the treatment of PTSD and trauma-related comorbidities (Valiente-Gómez *et al.*, 2017).

Given the high prevalence of traumatic experiences in FEDs and the demonstrated efficacy of EMDR for trauma-related conditions, some authors have argued that EMDR may be a promising intervention for FEDs (Balbo *et al.*, 2017). However, empirical evidence remains scarce. For instance, Zaccagnino and colleagues (2017) reported a case study of a 17-year-old inpatient with unremitting AN who underwent EMDR for 6 months. Post-treatment, the patient showed weight and body mass index (BMI) gain, improved attachment style, self-confidence, and social functioning, with improvements maintained at 12- and 24-month follow-ups. Ergüney-Okumuş (2021) described a case of BN treated with 20 sessions of CBT-E followed by 5 sessions of EMDR focused on body image. After the intervention, the patient reported substantial improvements in eating-related symptoms (binge eating, restricting, and preoccupation with weight, shape, and eating), as well as in motivation, body satisfaction, and social functioning.

To the best of our knowledge, no study to date has investigated the efficacy of EMDR in the treatment of BED. Therefore, a two-arm randomized controlled trial (RCT) with a mixed between-within design was conducted to test the efficacy of a 4-week EMDR intervention compared to a parallel CBT intervention in a sample of inpatients with BED and comorbid obesity, and who experienced traumatic events.

CBT was selected as the comparator because it is an established evidence-based treatment for BED. As a primarily present-focused approach, it may have a more indirect impact on unresolved traumatic experiences. In contrast, EMDR targets distressing traumatic memories and their emotional and physiological correlates, and may therefore contribute to improvements in trauma-related symptoms and emotion regulation, which could generalize to reductions in binge eating symptoms, emotional eating, and psychological distress.

The EMDR intervention was thus hypothesized to be more effective than the CBT intervention in reducing the impact of traumatic experiences, BED symptoms, emotional eating, and psychological distress, and in improving emotion regulation.

Materials and Methods

Participants and procedures

Recruitment for the RCT started in May 2023 and ended in February 2025 at the IRCCS Istituto Auxologico Italiano, Piancavallo (VCO, Italy), a third-level, residential clinical center for the rehabilitation of obesity and eating disorders.

A total of 31 inpatients attending the rehabilitation program were consecutively recruited according to the following inclusion criteria: being a female Italian inpatient with obesity (BMI: Kg/m^2>30, World Health Organization [WHO]) and BED (according to the DSM-5), aged between 18 and 65 years, and with a self-reported history of one traumatic experience at least. Inpatients were excluded if they had any physical or psychiatric disorder or any other medical condition that could compromise participation in the RCT.

Patients were screened for inclusion into the RCT during the first hospitalization week. After a routine clinical interview conducted by an independent licensed psychologist, patients who met the eligibility criteria were invited to participate in the RCT by a member of the research team, who informed them about the RCT objectives and procedures. Eligible patients who accepted to participate and signed the informed consent forms for participation and data treatment were asked to complete a battery of self-report questionnaires to collect demographic data and measure outcome variables. The questionnaires completed by participants were stored in a locked cabinet, while data were stored in a password-protected Excel file.

After completing the pre-intervention assessment, participants were randomly assigned 1:1 into one of the two treatment conditions: 16 to CBT and 15 to EMDR. Random numbers for block randomization were created using the web application available on www.randomization.org. Allocation concealment was ensured since all participants received an anonymous number associated with the randomization sequence that was generated. Only participants and researchers who stored and analyzed data were blinded to the treatment assignments.

No adverse or unintended effects due to participation in the RCT were expected. However, in case of any form of psychological discomfort, participants could consult the psychologists in the hospital divisions where they were located. Moreover, in case of any doubts or further need for information, participants could contact the principal investigator (PI) or his delegate. Once enrolled, participants could withdraw from the study at any stage without any consequence.

The timeline of the intervention is depicted in Table 1.

Table 1. Participant timeline.

	Enrollment	Pre-intervention	Intervention				Post-intervention
	week 1	week 1	week 1	week 2	week 3	week 4	week 4
Enrollment							
Eligibility screen	X						
Informed consent	X						
Allocation		X					
Intervention							
EMDR			X				
CBT			X				
Assessment							
Demographical data (IES-R, BES, DASS-21, DEBQ, DERS)		X					X

EMDR, eye movement desensitization and reprocessing; CBT, cognitive behavioral therapy; IES-R, Impact of Event Scale-Revised; BES, Binge Eating Scale; DASS, Depression Anxiety and Stress Scale; DEBQ, Dutch Eating Behavior Questionnaire; DERS, Difficulties in Emotion Regulation Scale.

Interventions

Both the EMDR and CBT interventions were delivered during an inpatient multidisciplinary rehabilitation program for weight loss, which is composed of medical, nutritional, physical, and psychological components. Patients attending the program are placed on a hypocaloric balanced diet provided by dietitians (1200-1700 kcal/day) and containing about 21% protein, 53% carbohydrates, and 26% lipids. They receive nutritional counseling provided both in individual and group sessions, and perform physical activity once a day (1 hour) with trainers and physiotherapists, which consists of indoor and outdoor walking, dynamic exercises of the upper and lower limbs at moderate intensity, and 15-20 minutes of aerobic exercise. Psychological support is also routinely provided to patients in need of psychological care by licensed psychologists and psychotherapists. Trial participants did not receive the usual psychological support but were randomly assigned to the EMDR or the CBT treatment condition. Both interventions consisted of weekly 1-hour individual sessions with a licensed EMDR or CBT psychotherapist for 4 weeks.

The EMDR intervention was based on the standard protocol of EMDR, a therapeutic approach used for the treatment of trauma and stress-related disturbances (Shapiro & Maxfield, 2002). It focuses on the memory of traumatic experiences, and it is a comprehensive methodology that uses eye movements or other forms of dual attentional bilateral stimulation to treat disorders related directly to traumatic or particularly stressful experiences. EMDR is based on the adaptive information process (AIP) model, which posits that the traumatic event experienced by a subject is stored in memory along with the disturbing emotions, perceptions, cognitions, and physical sensations that characterized that moment. All this information is stored in a dysfunctional way within neural networks and is unable to connect with other networks with useful information. The information enclosed in the neural networks, not processed, continues to cause discomfort in the subject, up to the onset of pathologies such as PTSD and other psychological disorders. The goal of EMDR is to restore the adaptive processing of information in order to achieve adaptive resolution by creating new and more functional connections. The EMDR protocol is an eight-phase treatment approach that addresses adverse life events. During memory processing, the subject is asked to focus on aspects of a past memory that continue to be disturbing for short intervals of time, while simultaneously experiencing dual attention (typically eye movement). The subject is asked to give feedback between the sets of bilateral stimulation, briefly reporting on the experience to ensure that processing is taking place. This procedure is repeated until the targeted memory is resolved and the subject reports that bringing the traumatic memory to mind no longer generates distress.

The CBT intervention is based on the core principles of both the CBT-E, an evidence-based treatment for eating disorders, and the cognitive behavioral therapy for obesity (CBT-OB) (Grave *et al.*, 2018). CBT-E is based on the transdiagnostic theory for eating disorders. According to this theory, there is an overvaluation of shape, weight, eating, and the control that people use to judge themselves, which represents the core feature of maintaining eating disorder symptoms, including binge eating. The goals of CBT-E are to increase the understanding of eating disorders, reduce weight concerns, and establish a pattern of regular eating by addressing the mechanisms that have been maintaining the eating disorder psychopathology, including body image disturbances and reactions to life events and emotions. CBT-OB combines the principal strategies of the traditional behavioral therapy for obesity (self-monitoring, goal setting, stimulus control) with more specific cognitive strategies and procedures, helping patients to address the cognitive processes involved with treatment discontinuation, the amount of weight lost, and long-term weight-loss maintenance. The goals of CBT-OB are to help patients reach, accept, and maintain a healthy weight loss by adopting a healthy lifestyle.

The EMDR intervention was delivered by a licensed psychologist with specific training in EMDR, while the CBT intervention was delivered by a licensed psychologist with specific training in CBT. Both of them had similar ages and years of clinical practice in the treatment of eating disorders.

Outcome measures

Participants filled in the following self-report questionnaire in a paper-and-pencil format before starting the interventions and soon after their completion:

i) The Italian-validated version (Craparo *et al.*, 2013) of the Impact of Event Scale-Revised (IES-R; Weiss, 2007). It is a self-report questionnaire composed of 22 items rated on a 5-point Likert scale ranging from 0 to 4, used to assess subjective distress caused by traumatic events. The IES-R yields a total score (ranging from 0 to 88) and scores for the Intrusion, Avoidance, and Hyperarousal sub-scales. All sub-scales of the Italian version showed good internal consistency (Hyperarousal, α=0.83; Avoidance, α=0.72; Intrusion, α=0.78). In this study, Cronbach's alpha (α) and McDodanld's Omega (ω) were 0.744 and 0.779 for Intrusion, 0.704 and 0.720 for Avoidance, 0.631 and 0.624 for Hyperarousal, 0.760 and 0.780 for the total score at baseline, and 0.917 and 0.922 for Intrusion, 0.805 and 0.810 for

Avoidance, 0.909 and 0.912 for Hyperarousal, and 0.950 and 0.953 for the total score at post-treatment.

ii) The Italian-validated version (Ricca *et al.*, 2000) of the Binge Eating Scale (BES; Gormally *et al.*, 1982). It is a self-report questionnaire composed of 16 groups of items assessing the presence of binge eating episodes. Specifically, 8 items describe behavior manifestations, and 8 items refer to feelings and cognitions surrounding a binge episode. The total score ranged from 0 to 46. The higher the score, the more severe the binge eating problems. In an Italian study evaluating its psychometric properties, the Italian version of BES showed good internal consistency reliability (α=0.89) (Imperatori *et al.*, 2016). In this study, α and ω were 0.830 and 0.848 at baseline, and 0.952 and 0.957 at post-treatment.

iii) The Italian-validated version (Bottesi *et al.*, 2015) of the Depression Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1996). It is a self-report questionnaire composed of 21 items rated on a 4-point Likert scale, ranging from 0 to 3, composing three sub-scales: Depression, Anxiety, and Stress. The validation of the Italian version showed that Cronbach's α coefficients exceeded .70 both in the community and clinical samples, thus indicating good to excellent internal consistency. Test-retest reliability values computed on the undergraduate student sample were large for all the DASS-21 scale scores. In this study, α and ω were 0.906 and 0.917 for Depression, 0.696 and 0.724 for Anxiety, 0.897 and 0.900 for Stress, and 0.947 and 0.949 for Depression, 0.852 and 0.880 for Anxiety, and 0.915 and 0.917 for Stress at post-treatment.

iv) The Emotional Eating sub-scale of the Italian-validated version (Dakanalis *et al.*, 2013) of the Dutch Eating Behavior Questionnaire (DEBQ; van Strien *et al.*, 1986). It is composed of 13 items, rated on a 5-step Likert scale ranging from 0 to 4. The validation of the Italian version showed that DEBQ subscales have a high test-retest reliability. Cronbach's α coefficient for the Emotional Eating scale indicated an adequate internal consistency. In this study, α and ω were 0.936 and 0.948 at baseline, 0.976 and 0.977 at post-treatment.

v) The Italian-validated version (Giromini *et al.*, 2012) of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). It is a self-report questionnaire consisting of 36 items, rated on a 5-point Likert scale ranging from 1 to 5, which explores the following sub-scales: non-acceptance of negative emotions, inability to undertake purposeful behavior when experiencing negative emotions, difficulty in controlling impulsive behavior when experiencing negative emotions, limited access to emotion regulation strategies that are considered effective, lack of awareness of one's emotions, lack of understanding of the nature of one's emotional responses. Results from the Italian validation showed that the DERS has high internal consistency with a Cronbach's α of .92 for the DERS total score and α>.80 for most sub-scales. The test-retest reliability was excellent for the DERS total score, fair for Clarity, and good for Non-acceptance, Goals, Impulse, Awareness, and Strategies. In this study, α and ω were 0.852 and 0.859 for Awareness, 0.827 and 0.837 for Clarity, 0.774 and 0.801 for Goals, 0.838 and 0.844 for Impulse, 0.851 and 0.855 for Non-acceptance, 0.881 and 0.888 for Strategies, 0.920 and 0.928 for the total score at baseline, and 0.851 and 0.858 for Awareness, 0.907 and 0.918 for Clarity, 0.855 and 0.861 for Goals, 0.828 and 0.849 for Impulse, 0.901 and 0.906 for Non-acceptance, 0.832-0.861 for Strategies, 0.948 and 0.952 for the total score at post-treatment.

Statistical analysis

The software program G*Power (Version 3.1.9.4) was used to compute the sample size for detecting a small interaction effect of treatment × time in mixed analysis of variance (ANOVA) at the 0.01 α error probability and with a 0.9 power. The result showed a target sample size of 100 participants, equally distributed between the two trial arms (50 in the EMDR arm and 50 in the CBT arm). However, it was not possible to achieve the required sample size because of the limited number of patients fulfilling the eligibility criteria during the recruitment phase. Moreover, the enrollment period was restricted by the predefined study timeline, as the trial was conducted within the planned duration. Similarly, the allocated funding was available only for the scheduled study period, preventing any extension of recruitment.

Measures of central tendency (mean [M] or median), dispersion (standard deviation [SD] or interquartile range), and absolute and relative frequencies were computed to describe the sample. Skewness and kurtosis, and the modified z-score (computed in each group separately) with a threshold equal to 3 were also used to assess data distributions and detect outliers, respectively. The influence of outliers on results was inspected by running and comparing two analyses, one including outliers and one excluding them.

A series of mixed between-within 2×2 ANOVAs (one for each outcome) was conducted to test the moderating effects of the treatment factor (EMDR *vs.* CBT) on changes in outcome measures. The ANOVA model included the within-subject factor (repeated measures: pre *vs.* post), the treatment factor (EMDR *vs.* CBT), and their interaction for each outcome. Plots and Bonferroni *post-hoc* tests were used to probe statistically significant interactions. A series of paired *t*-test were also conducted to test the statistical significance of pre-post changes and to compute Cohen's d effect sizes.

The significance level (α) was set at .01 for all ANOVA models and *t*-tests in order to limit type I error inflation due to multiple comparisons.

Reliable changes (RCs; Bauer *et al.*, 2004) were computed to explore significant pre-post changes at the individual level. RCs were calculated only for scales with SDs and Cronbach's α from Italian normative samples, and compared against each participant's change scores (post-pre) to detect statistically significant changes (in both directions) and to classify participants into three categories: 1) statistically significant improvement; 2) no statistically significant change, and 3) statistically significant worsening. Clinical cut-offs (Bauer *et al.*, 2004) were also computed for scales without pre-defined clinical thresholds but with normative means and SDs from Italian community and clinical samples, and were used to detect clinically significant changes and to classify participants into four categories: 1) clinically significant improvement (scores above the cutoff at pre-assessment and below the cutoff at post-assessment); 2) no clinically significant improvement (scores above the cutoff at pre and post-assessment); 3) clinically significant worsening (scores below the cut-off at pre-assessment and above the cutoff at post-assessment) and 4) no clinical condition (scores below the cut-off both at pre and post-assessment). RCs and clinical cut-offs are reported in Table 2.

All analyses followed the intention-to-treat principle and included all randomized participants.

Results

Sample descriptive statistics

Participants aged 18-64 years (M=43.8, SD=14.2); one of them did not report age. Most were from northern Italy (71%), with the remaining 29% from central and southern regions. Educational attainment was as follows: elementary school (3.2%), secondary school (54.8%), high school (16.1%), university degree (12.9%), and master's or doctoral degree (12.9%). Most were single (54.8%), with the remainder married, separated, or divorced. Regarding employment, 74.2% were unemployed or employed as executives, workers, or clerical staff, 25.8% had other employment, and none were self-employed. In the CBT group (n=16), the mean (SD) age was 43.8 (15.4), the mean (SD) BMI at baseline was 47.6 (6.11), most of the participants were from northern Italy (41.9%), had a high school degree (29%), and were single (32.3%). In the EMDR group (n=15), mean age (SD) was 43.8 (13.3), mean (SD) BMI at baseline was 42.5 (3.89), most of the participants were from northern Italy (29%), had a high school degree (29.8%), and were single (22.6%). Outliers and descriptive statistics of the sample are presented in Tables 3 and 4, respectively.

Table 2. Reliable changes and clinical cut-offs for scales with normative data.

	Reliable change	Clinical cut-off
DASS – Depression	3.76	5.03
DASS – Anxiety	3.67	3.52
DASS – Stress	4.08	7.59
DEBQ – Emotional Eating	0.44	2.18
BES		17
DERS – Non-acceptance	5.14	
DERS – Goals	4.4	
DERS – Impulse	4.46	
DERS – Awareness	5.32	
DERS – Strategies	5.7	
DERS – Clarity	3.77	
DERS – Total	14.5	

DASS, Depression Anxiety and Stress Scale; DEBQ, Dutch Eating Behavior Questionnaire; BES, Binge Eating Scale; DERS, Difficulties in Emotion Regulation Scale.

Table 3. Outliers summary.

Variable name	Group	Row number	Modified z-score
Anxiety_post	0	2	4.72
Anxiety_post	0	6	7.42
Anxiety_post	0	10	3.37
Anxiety_post	1	24	4.72
Anxiety_post	1	27	3.37
BES_post_tot	1	29	−3.04
BMI_post	0	9	−3.09
BMI_post	0	13	3.42
BMI_pre	0	13	3.43
Clarity_post	1	24	3.04
Clarity_post	1	27	3.04
Clarity_post	1	28	3.04
Depression_post	0	6	3.18
Depression_post	1	25	3.04
Depression_post	1	27	3.71
Goals_pre	1	25	3.04
Weight_pre	0	13	3.20
Stress_post	0	2	4.05
Stress_post	0	6	7.19
Stress_post	1	24	3.04
Stress_pre	1	18	−3.04

Group 0, cognitive behavioral therapy; Group 1, eye movement desensitization and reprocessing; BES, Binge Eating Scale; BMI, body mass index.

Table 4. Sample demographics.

		Total sample n=31	CBT n=15	EMDR n=16
Age, mean±SD		43.8±14.2	43.8±15.4	43.8±13.3
Origin, n (%)	Northern Italy	22 (71.0)	13 (81.3)	9 (60.0)
	Central Italy	5 (16.1)	0 (0.0)	5 (33.3)
	Southern Italy	4 (12.9)	3 (18.8)	1 (6.7)
Level of education, n (%)	Elementary school	1 (3.2)	1 (6.3)	0 (0.0)
	Middle school	5 (16.1)	1 (6.3)	4 (26.7)
	High school	17 (54.8)	9 (56.3)	8 (53.3)
	Bachelor's degree	4 (12.9)	3 (18.8)	1 (6.7)
	Doctorate/Master's degree	4 (12.9)	2 (12.5)	2 (13.3)
Marital status, n (%)	Single	17 (54.8)	10 (62.5)	7 (46.7)
	Married	9 (29.0)	4 (25.0)	5 (33.3)
	Separated/divorced	5 (16.1)	2 (12.5)	3 (20.0)
Employment status, n (%)	Worker	1 (3.2)	0 (0.0)	1 (6.7)
	Employee/office worker	16 (51.6)	9 (56.3)	7 (46.7)
	Manager/executive	2 (6.5)	0 (0.0)	2 (13.3)
	Unemployed	4 (12.9)	2 (12.5)	2 (13.3)
	Other	8 (25.8)	5 (31.3)	3 (20.0)

CBT, cognitive behavioral therapy; EMDR, eye movement desensitization and reprocessing; SD, standard deviation.

EMDR *vs.* CBT

No statistically significant interaction effect was found for any outcome variables. Only statistically significant within-subject effects were observed. In particular, statistically significant improvements were found for all DASS scales (Depression, Anxiety, and Stress), the DEBQ Emotional Eating sub-scale, two DERS sub-scales (Clarity and Strategies), and the DERS total score, BES, two IES-R sub-scales (Intrusion and Hyperarousal), and the IES-R total score on average. A series of paired *t*-tests confirmed these findings and showed very small pre-post effect sizes (Cohen's d). No statistically significant between-subject effect was observed, indicating that the two groups did not differ overall on outcome variables. Likewise, no statistically significant *post-hoc* difference was found in baseline scores on average. When outliers were excluded, only negligible changes were observed in the results, and no effect reached or lost statistical significance. Pre- and post-treatment data, ANOVA results, and effect sizes are presented in Table 5.

Table 5. Pre- and post-treatment data, effect sizes, and ANOVA results.

Outcomes			Total sample n=31, mean (SD)	CBT n=15, mean (SD)	EMDR n=16, mean (SD)	Fs (df, p-value)
DASS	Depression	Pre	22.9 (±12.6)	23.3 (±12.3)	22.5 (±13.3)	B-S effect: 0.1 (1, 0.758)
		Post	11.2 (±11.2)	12.0 (±13.2)	10.3 (±8.84)	Interaction: 0.08 (1, 0.781)
		d (95% CI)	1.18 (0.72, 1.64)			W-S effect: 42.09 (1, <.001)
	Anxiety	Pre	14.2 (±7.2)	11.9 (±7.3)	16.7 (±6.5)	B-S effect: 0.65 (1, 0.427)
		Post	8.32 (±8.53)	9.00 (±10.6)	7.6 (±5.91)	Interaction: 2.73 (1, 0.109)
		d (95% CI)	0.55 (0.17, 0.93)			W-S effect: 10.16 (1, 0.003)
	Stress	Pre	24.5 (±10.0)	22.3 (±10.7)	26.9 (±8.8)	B-S effect: 0.519 (1, 0.477)
		Post	11.7 (±8.8)	12.0 (±10.6)	11.3 (±6.66)	Interaction: 1.96 (1, 0.172)
		d (95% CI)	1.19 (0.73, 1.65)			W-S effect: 45.84 (1, <.001)
DEBQ	Emotional eating	Pre	3.21 (±0.78)	3.10 (±0.93)	3.32 (±0.59)	B-S effect: 0.941 (1, 0.34)
		Post	2.44 (±1.16)	2.26 (±1.13)	2.63 (±0.99)	Interaction: 0.166 (1, 0.687)
		d (95% CI)	0.74 (0.34, 1.14)			W-S effect: 16.31 (1, <.001)
DERS	Awareness	Pre	17.9 (±6.32)	19.1 (±6.66)	16.5 (±5.85)	B-S effect: 0.148 (1, 0.704)
		Post	17.5 (±5.61)	16.9 (±6.64)	18.1 (±4.43)	Interaction: 3.415 (1, 0.075)
		d (95% CI)	0.07 (−0.29, 0.42)			W-S effect: 0.106 (1, 0.748)
	Clarity	Pre	14.7 (±4.87)	14.9 (±5.39)	14.5 (±4.42)	B-S effect: 0.014 (1, 0.906)
		Post	12.7 (±5.37)	12.3 (±6.19)	13.1 (±4.5)	Interaction: 0.809 (1, 0.376)
		d (95% CI)	0.52 (0.14, 0.89)			W-S effect: 8.127 (1, 0.008)
	Goals	Pre	17.8 (±4.73)	19.4 (±4.43)	16.1 (±4.57)	B-S effect: 3.38 (1, 0.076)
		Post	15.3 (±5.94)	16.5 (±6.34)	14.0 (±5.2)	Interaction: 0.164 (1, 0.688)
		d (95% CI)	0.45 (0.08, 0.82)			W-S effect: 6.142 (1, 0.019)
	Impulse	Pre	17.0 (±5.87)	15.7 (±6.09)	18.3 (±5.51)	B-S effect: 0.55 (1, 0.464)
		Post	15.3 (±5.94)	15.2 (±6.19)	15.4 (±5.88)	Interaction: 1.794 (1, 0.191)
		d (95% CI)	0.33 (−0.03, 0.69)			W-S effect: 3.572 (1, 0.069)
	Non-acceptance	Pre	18.4 (±6.43)	16.9 (±7.16)	19.9 (±5.34)	B-S effect: 0.576 (1, 0.454)
		Post	16.3 (±7.02)	16.1 (±8.72)	16.5 (±4.93)	Interaction: 2.101 (1, 0.158)
		d (95% CI)	0.39 (0.02, 0.75)			W-S effect: 5.061 (1, 0.032)
	Strategies	Pre	24.8 (±8.19)	23.4 (±7.97)	26.3 (±8.44)	B-S effect: 0.187 (1, 0.668)
		Post	21.1 (±7.2)	21.4 (±8.31)	20.7 (±6.08)	Interaction: 1.765 (1, 0.194)
		d (95% CI)	0.50 (0.12, 0.87)			W-S effect: 8.025 (1, 0.008)
	Total score	Pre	110 (±25.3)	109 (±26.5)	112 (±24.8)	B-S effect: 0.007 (1, 0.933)
		Post	98.2 (±29.8)	98.5 (±36.2)	97.8 (±22.3)	Interaction: 0.12 (1, 0.731)
		d (95% CI)	0.53 (0.15, 0.90)			W-S effect: 8.347 (1, 0.007)
BES	Binge eating	Pre	31.6 (±8.9)	31.0 (±9.8)	32.3 (±8.1)	B-S effect: 0.172 (1, 0.681)
		Post	22.8 (±13.3)	22.0 (±15.4)	23.7 (±11.2)	Interaction: 0.009 (1, 0926)
		d (95% CI)	0.76 (0.36, 1.16)			W-S effect: 17.199 (1, <.001)
IES-R	Avoidance	Pre	2.07 (±0.75)	2.3 (±0.8)	1.83 (±0.64)	B-S effect: 1.993 (1, 0.169)
		Post	1.69 (±0.92)	1.82 (±1.05)	1.55 (±0.78)	Interaction: 0.423 (1, 0.52)
		d (95% CI)	0.47 (0.10, 0.84)			W-S effect: 6.547 (1, 0.016)
	Intrusion	Pre	2.66 (±0.72)	2.69 (±0.9)	2.63 (±0.53)	B-S effect: 0.31 (1, 0.582)
		Post	1.95 (±1.06)	2.07 (±1.18)	1.82 (±0.95)	Interaction: 0.262 (1, 0.613)
		d (95% CI)	0.69 (0.29, 1.08)			W-S effect: 14.31 (1, <.001)
	Hyperarousal	Pre	2.35 (±0.8)	2.4 (±1.00)	2.3 (±0.53)	B-S effect: 0.249 (1, 0.622)
		Post	1.67 (±1.23)	1.78 (±1.4)	1.54 (±1.05)	Interaction: 0.158 (1, 0.694)
		d (95% CI)	0.69 (0.30, 1.08)			W-S effect: 14.5 (1, <.001)
	Total score	Pre	51.0 (±11.9)	54.1 (±12.4)	47.6 (±10.7)	B-S effect: 1.535 (1, 0.225)
		Post	38.5 (±21.8)	41.8 (±24.0)	34.9 (±19.3)	Interaction: 0.003 (1, 0.956)
		d (95% CI)	0.71 (0.32, 1.10)			W-S effect: 15.06 (1, <.001)

CBT, cognitive behavioral therapy; EMDR, eye movement desensitization and reprocessing; SD, standard deviation; DASS, Depression Anxiety and Stress Scale; CI, confidence interval; DEBQ, Dutch Eating Behavior Questionnaire; DERS, Difficulties in Emotion Regulation Scale; BES, Binge Eating Scale; IES-R, Impact of Event Scale-Revised; B-S, between-subject; W-S, within-subject.

Regarding reliable and clinically significant changes at the individual level, the data necessary to compute reliable change indices and clinical cut-offs were available only for the DASS and DEBQ scales, whereas only reliable change indices could be computed for the DERS scales, and only a pre-defined clinical cut-off was available for the BES. Raw numbers of participants classified in each category, as specified in the *Statistical analysis* section, are reported in Table 6. These show that most participants in both

Table 6. Reliable change and clinically significant change after CBT and EMDR.

Reliable change	CBT	EMDR	Clinically significant change	CBT	EMDR
DASS – Depression					
Statistically improved	13	12	Clinically changed	5	3
No statistical change	2	2	No clinical status	1	2
Statistically worsened	1	1	No clinical change	10	10
Total	16	15			
DASS – Anxiety					
Statistically improved	9	11	Clinically changed	4	4
No statistical change	4	4	No clinical status	2	0
Statistically worsened	3	0	No clinical change	10	11
Total	16	15			
DASS – Stress					
Statistically improved	12	13	Clinically changed	3	4
No statistical change	2	2	No clinical status	2	0
Statistically worsened	2	0	No clinical change	11	11
Total	16	15			
DEBQ – Emotional eating					
Statistically improved	9	9	Clinically changed	5	4
No statistical change	6	5	No clinical status	3	0
Statistically worsened	1	1	No clinical change	8	11
Total	16	15			
BES					
			Clinically changed	7	5
			No clinical status	1	0
			No clinical change	8	9
			Clinically worsened	0	1
DERS – Awareness					
Statistically improved	3	1			
No statistical change	12	10			
Statistically worsened	1	4			
Total	16	15			
DERS – Clarity					
Statistically improved	5	3			
No statistical change	10	12			
Statistically worsened	1	0			
Total	16	15			
DERS – Goals					
Statistically improved	4	5			
No statistical change	11	9			
Statistically worsened	1	1			
Total	16	15			
DERS – Impulse					
Statistically improved	3	4			
No statistical change	10	10			
Statistically worsened	3	1			
Total	16	15			
DERS – Non-acceptance					
Statistically improved	2	6			
No statistical change	12	8			
Statistically worsened	2	1			
Total	16	15			
DERS – Strategies					
Statistically improved	4	6			
No statistical change	10	9			
Statistically worsened	2	0			
Total	16	15			
DERS – Total score					
Statistically improved	7	7			
No statistical change	5	7			
Statistically worsened	4	1			
Total	16	15			

CBT, cognitive behavioral therapy; EMDR, eye movement desensitization and reprocessing; DASS, Depression Anxiety and Stress Scale; DEBQ, Dutch Eating Behavior Questionnaire; BES, Binge Eating Scale; DERS, Difficulties in Emotion Regulation Scale.

groups exhibited statistically significant improvements on all DASS scales, as well as on the DEBQ Emotional Eating scale. However, only a small number achieved clinically significant improvements on those scales. This means that, although pre-post changes were statistically significant for most participants in both conditions, only a minority achieved a clinically significant improvement, defined by reporting a score above the clinical cut-off at pre-assessment and below it at post-assessment. With respect to the BES, no clear difference emerged between the numbers of participants showing *vs.* not showing a clinically significant improvement, defined as above. Finally, most participants in both groups showed no statistically significant changes on DERS subscales, although a larger number demonstrated statistically significant improvements on the DERS total score.

Discussion

The present study represents, to the best of our knowledge, the first randomized controlled trial directly comparing EMDR and CBT in inpatients with BED, comorbid obesity, and self-reported traumatic life events. Contrary to our initial hypothesis, no statistically significant difference emerged between the two treatment conditions with respect to depression, anxiety, stress, emotional eating, binge eating, emotion regulation, trauma-related variables such as avoidance, intrusion, and hyperarousal. Statistically significant improvements were observed in the whole sample on several outcomes measures, including depression, anxiety, stress, emotional eating, binge eating, two DERS domains (Clarity: the ability to understand and clearly identify one's emotions, and Strategies: the perceived availability of effective strategies to regulate distress when upset) and the DERS total score (the overall ability to effectively understand, manage, and regulate emotions), two IES-R domains (Intrusion: the frequency and intensity of involuntary and distressing thoughts, images, or memories of the traumatic event, and Hyperarousal: symptoms of increased physiological and emotional reactivity, such as irritability, heightened startle response, and difficulty concentrating or sleeping) and the IES-R total score (the overall severity of post-traumatic stress symptoms). However, the standardized sizes of these improvements (Cohen's d) were small.

Several factors may account for the lack of between-group differences. First, statistical power was limited due to the small sample size. With only 31 participants completing the study, the probability of detecting small-to-moderate treatment differences was substantially reduced. Future studies with larger samples are needed to clarify whether EMDR might provide additional benefits compared to CBT in this population. Second, the hospital setting may have influenced treatment outcomes. Participants received intensive multidisciplinary care, including medical and nutritional support. Such a structured and supportive environment may have overshadowed potential differences between EMDR and CBT, since both groups benefited from the same comprehensive inpatient treatment program. Third, the short duration of the interventions must be considered. Both EMDR and CBT-E are usually delivered over longer periods (*e.g.*, 20 or more sessions for standard EMDR protocols; 20-40 sessions for CBT-E), whereas in the present study, participants received a 4-week intervention. It is therefore possible that the brevity of treatment prevented the full unfolding of the specific therapeutic mechanisms underlying each approach, particularly for EMDR, which typically requires multiple sessions to fully process trauma-related memories. Another explanation relates to the overlap in treatment targets. Both EMDR and CBT address maladaptive cognitions, emotional regulation difficulties, and stress, albeit through different mechanisms. Given the strong role of trauma in BED, it is possible that CBT also indirectly reduced trauma-related distress by modifying dysfunctional beliefs and coping strategies, thereby narrowing the gap with EMDR. Finally, the relatively low rates of clinically significant change at the individual level suggest that, while participants improved statistically, many did not reach thresholds indicative of meaningful recovery. This finding highlights the chronic and complex nature of BED with comorbid obesity and trauma history, and suggests that more intensive or longer interventions may be required to achieve clinically relevant improvements.

Taken together, our preliminary results indicate that both EMDR and CBT can contribute to improvements in psychological distress, eating-related psychopathology, emotion regulation, and traumatic symptoms in inpatients with BED and obesity, but no clear superiority of one approach over the other emerged under the current study conditions. Future research should replicate these findings with larger samples, extended treatment durations, and in outpatient settings to better capture potential differential effects of EMDR and CBT.

Conclusions

Contrary to our hypothesis, no significant difference emerged between the two treatment approaches on outcome variables, many of which showed significant but small improvements across the groups. These findings indicate that EMDR and CBT may yield similar benefits in reducing psychological distress, eating-related psychopathology, emotion regulation difficulties, and trauma-related symptoms in inpatients with BED, comorbid obesity, and a history of traumatic life events. However, these conclusions should be interpreted with caution and should be considered preliminary.

A major limitation of the present study is the absence of a control group (*e.g.*, no-treatment condition), which prevents disentangling the specific effects of EMDR and CBT from those attributable to the broader inpatient program. Consequently, causal inferences regarding the effectiveness of the two interventions cannot be drawn. In addition, the very brief duration of both treatments represents a further critical limitation. The number of sessions delivered was substantially shorter than what is typically recommended in EMDR and CBT protocols, potentially limiting the ability to detect potential different outcomes between approaches.

Finally, the exclusively female sample restricts the generalizability of the findings, as results may not extend to males with BED, obesity, and trauma histories.

Future studies should address these limitations by employing larger and more heterogeneous samples, including male participants, implementing longer and more standardized treatment protocols, and incorporating follow-up assessments to evaluate treatment outcomes over time. Moreover, the inclusion of appropriate control or comparison groups of inpatients not receiving experimental treatments would allow for an evaluation of the specific contribution of EMDR relative to CBT in the treatment of BED with comorbid obesity and trauma-related symptomatology.

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Ethics approval and consent to participate: the RCT protocol was approved by the Ethical Committee of Istituto Auxologico Italiano IRCCS, Milan, Italy (approval number: 2016_10_25_07). The RCT is carried out in accordance with the ethical code of the Italian Psychology Association and the Declaration of Helsinki. All personal information about participants and records of all patients are collected and preserved separately, in a secure place, into password-protected Excel files kept for 5 years after the end of the trial. Eligible patients signed an informed consent form for participation and an informed consent form for data treatment.

Availability of data and materials: anonymized raw data are available at doi: 10.5281/zenodo.17233597.

Trial registration: the RCT was registered in the Open Science Framework public repository (OSF Registries) 6 months after starting to enroll participants and to collect data. The associated project code is osf.io/kyvhx, and the registration is doi: 10.17605/OSF.IO/KH65V.

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