Eye movement desensitisation and reprocessing as add-on treatment to enhanced cognitive behaviour therapy for patients with anorexia

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Eye movement desensitisation and reprocessing as add-on treatment to enhanced cognitive behaviour therapy for patients with anorexia nervosa reporting childhood maltreatment: A quasi-experimental multicenter study

Eleonora Rossi[1] | Emanuele Cassioli[1] | Lucia Cecci[1] | Francesca Arganini[1] | Michela Martelli[1] | Carolina Alberta Redaelli[1] | Simona Anselmetti[3] | Sara Bertelli[2] | Isabel Fernandez[4] | Valdo Ricca[1] | Giovanni Castellini[1]

[1]Psychiatry Unit, Department of Health Sciences, University of Florence, Florence, Italy

[2]Department of Mental Health, ASST Santi Paolo e Carlo, Milan, Italy

[3]EMDR Italian Association, Varedo, Italy

[4]Psychotraumatology Research Center, Milan, Italy

Correspondence
Giovanni Castellini.
Email: giovanni.castellini@unifi.it

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Abstract

Objective: This quasi-experimental study aimed to compare the outcome of patients with Anorexia Nervosa (AN) reporting moderate/severe childhood maltreatment (CM) treated exclusively with Enhanced Cognitive Behaviour Therapy (CBT-E) or with CBT-E *plus* Eye Movement Desensitisation and Reprocessing (EMDR).

Method: A total of 75 patients with AN reporting moderate/severe CM were initially assessed regarding body mass index (BMI), general and eating disorder (ED)-specific psychopathology, and dissociative symptoms, and re-evaluated after 40 CBT-E sessions (T1). Then, 18 patients received EMDR, whereas the others were placed on a waiting list and continued CBT-E. T2 assessment was performed after 20–25 sessions of EMDR or CBT-E. A control group of 67 patients without CM was also enroled and treated with CBT-E.

Results: Contrary to patients without CM, neither of the traumatised groups improved in BMI, general and ED psychopathology, or dissociation at T1. However, at T2, both traumatised groups improved in BMI and ED-specific psychopathology, with the CBT + EMDR group demonstrating greater improvements. Moreover, only the CBT + EMDR group improved in general psychopathology and dissociative symptoms. The reduction of ED symptoms in traumatised patients was mediated by the amelioration of dissociation.

Discussion: The addition of EMDR to CBT-E may benefit patients with AN reporting moderate/severe CM.

K E Y W O R D S
anorexia nervosa, CBT-E, childhood maltreatment, eating disorders, EMDR, enhanced

Highlights

- Patients with Anorexia Nervosa (AN) and a history of Childhood Maltreatment (CM) who were treated with a combination of Enhanced Cognitive Behaviour Therapy (CBT-E) and Eye Movement Desensitisation and Reprocessing (EMDR) (CBT + EMDR group) achieved significantly greater weight recovery and a more substantial reduction in eating disorder-specific psychopathology compared to those who received CBT-E alone.
- Among patients with AN and a history of CM, only those who also received EMDR treatment in addition to CBT-E achieved a significant reduction in terms of general psychopathology and dissociative symptomatology.
- The reduction of eating disorder symptoms in patients with a history of CM was mediated by the improvement in dissociative symptoms.

1 | INTRODUCTION AND AIMS

Anorexia nervosa (AN) is a severe eating disorder (ED) characterised by an overvaluation of the importance of body shapes and weight for self-esteem and by pathological eating behaviours determining a substantial weight loss, possibly leading to severe malnutrition, cachexia, and related medical complications (American Psychiatric Association, 2022). Given the complexity of the psychological and physical symptoms of this disorder, international guidelines recommend the adoption of a multidisciplinary approach for the management of AN (Hilbert et al., 2017; National Institute for Health and Care Excellence, 2020). In this framework, psychotherapy is deemed a central part of treatment, and Enhanced Cognitive Behaviour Therapy (CBT-E) is considered among first line treatments (Hilbert et al., 2017; National Institute for Health and Care Excellence, 2020). This approach intervenes at the symptom level targeting dysfunctional behaviours and cognitions involved in maintaining the disorder (Fairburn, 2008), and several studies proved its efficacy in determining weight gain and an amelioration of ED psychopathology (Atwood & Friedman, 2020; Cassioli, Rossi, Vizzotto, et al., 2022; Dalle Grave et al., 2013, 2016; Ricca et al., 2010; Rossi, Castellini, et al., 2021). However, increasing evidence showed that treatment response is far from satisfactory, as remission rates are about 50% (Atwood & Friedman, 2020), with a consequent risk of chronicity, disability, and mortality (Steinhausen, 2009; Fichter & Quadflieg, 2016; van et al., 2020). Thus, scholars are investigating reasons for lack of response, including psychopathological features not adequately challenged by CBT-E, and possibly linked to different developmental trajectories (Cassioli, Rossi, D'Anna, et al., 2022; Halmi, 2013; Longo et al., 2023; Rossi et al., 2022).

History of childhood maltreatment (CM) is a recognized risk factor for the development of EDs, and the metanalysis performed by Molendijk et al. showed that an average of 26% of patients with AN had a history of sexual abuse, whereas 17% experienced physical CM, and 34% emotional CM (Molendijk et al., 2017). It has been suggested that CM might not just predispose the development of EDs, rather it could determine a distinct phenotypic presentation of these disorders, also referred to as *maltreated eco-phenotype* of EDs, with different clinical severity, symptom profiles, neurobiology, and longitudinal course (Day et al., 2023; Meneguzzo et al., 2022; Molendijk et al., 2017; Monteleone et al., 2021; Murray & Holton, 2021; Rodgers et al., 2019; Rossi, Cassioli, et al., 2021). In particular, patients with a history of CM often show a severer clinical presentation (e.g. more frequent binge eating-purging symptoms) (Carter et al., 2006; Molendijk et al., 2017), greater psychiatric comorbidities, including anxiety, depression and self-harm behaviours (Castellini et al., 2018; Favaro & Santonastaso, 2000; Molendijk et al., 2017), dysregulated sexual behaviours (Castellini, D'Anna, et al., 2020), higher levels of dissociative symptoms and emotion dysregulation (Cassioli, Rossi, D'Anna, et al., 2022; Longo et al., 2021; Rabito-Alcón et al., 2021), and different neurobiological correlates, such as hypothalamus pituitary adrenal axis impairment (Marciello et al., 2020; Monteleone et al., 2018a, 2018b, 2021), modifications in ghrelin levels (Rossi, Cassioli, et al., 2021), brain structures (Cascino et al., 2022; Monteleone et al., 2019), and longitudinal trend of menses alterations (Castellini, Rossi, et al., 2020). Furthermore, several studies showed that the presence of CM was associated with a worse long-term outcome (Carter et al., 2006; Mahon et al., 2001; Strangio et al., 2017), even when a cognitive-

behavioural approach was adopted (Cassioli, Rossi, D'Anna, et al., 2022; Castellini et al., 2018; Lelli et al., 2019). In contrast with these results, Calugi et al. (2018) showed that CBT-E treatment had comparable effects on both general and ED-specific psychopathology for patients with and without a history of sexual abuse (Calugi et al., 2018). However, it should be noted that in the latter study participants with and without a history of sexual abuse did not display differences in clinical and psychopathological features at baseline (Calugi et al., 2018), which is in contrast with the other above-mentioned studies. It could be hypothesised that the reduced effectiveness of CBT-E in patients with a history of trauma might be due to those psychopathological features that can stem from CM, including dissociation and psychiatric comorbidities, which are not adequately targeted by this approach (Trottier & MacDonald, 2017). Consequently, it may be worthwhile to investigate the potential benefits of incorporating trauma-focused therapies addressing post-traumatic psychopathological features in individuals with AN reporting CM.

Eye Movement Desensitisation and Reprocessing (EMDR) is a treatment based on short, imagined exposure to traumatic memories coupled with bilateral sensory stimulation (Shapiro, 2018), which has proven to be effective in the treatment of post-traumatic psychopathological features, including dissociation, as reported in several reviews and meta-analysis (Atchley & Bedford, 2021; Carletto et al., 2018; Seidler & Wagner, 2006; Van Minnen et al., 2016; Wilson et al., 2018). For this reason, it is recommended as a first-line treatment for post-traumatic stress disorder by international guidelines (Martin et al., 2021). Furthermore, a recent review of six randomized controlled trials highlighted the efficacy of this approach in reducing post-traumatic symptoms as well as depression and anxiety in individuals with a history of CM (Chen et al., 2018). Regarding the efficacy of EMDR in EDs, only a few studies are available and recent systematic reviews underlined that research on this topic is still under-represented (Balbo et al., 2017; Javinsky et al., 2022; Scelles & Bulnes, 2021). However, preliminary findings of existing studies underlined a promising potential for the use of this technique in treating EDs. For example, Zaccagnino et al. described the effect of EMDR in determining recovery from unremitting AN in a 17-years old inpatient (Zaccagnino, Cussino, et al., 2017), and the case report by Ergüney-Okumuş (2021) provided preliminary evidence for the possible effectiveness of CBT-E plus EMDR in the treatment of EDs (Ergüney-Okumuş, 2021). Indeed, it described the case of a patient with bulimia nervosa who reported important improvements in terms of ED symptoms as well as of body satisfaction and social

relationships after CBT-E plus EMDR. Furthermore, Zaccagnino et al. compared the effects of EMDR and of CBT in patients with AN and showed that both treatments determined an increase of Body Mass Index (BMI), but EMDR was more effective in determining an improvement of attachment security (Zaccagnino, Civilotti, et al., 2017). Finally, Bloomgarden et al. (2008) compared 43 women with EDs receiving standard residential treatment to 43 women receiving residential treatment plus EMDR and showed that those who were also offered EMDR reported less distress about memories related to negative body image and lower body dissatisfaction after treatment (Bloomgarden & Calogero, 2008).

Considering that EMDR addresses post-traumatic symptoms that are not targeted by CBT-E, including dissociation, it could be hypothesised that the add-on of EMDR to CBT-E might improve the prognosis of patients with AN reporting a history of moderate/severe CM. To the best of our knowledge, no available study has evaluated this hypothesis. Therefore, the main objective of this study was to compare the longitudinal trend of general and ED specific psychopathology, weight recovery and dissociation in patients with AN without a history of moderate/severe CM treated with CBT-E and that of patients reporting moderate/severe CM treated exclusively with CBT-E or with CBT-E plus EMDR, in order to verify whether the add-on of EMDR reduced or eliminated the well-known disparity in treatment response to CBT-E between patients with and without CM. In more detail, it was hypothesised that patients with a history of CM would respond less effectively to standard CBT-E treatment compared to those without, and that after the addition of EMDR, they would show greater improvements both in ED-related targets (body weight and ED-specific psychopathology) and in dimensions more closely related to trauma (general psychopathology and dissociative symptoms) as compared to patients with CM treated exclusively with CBT-E. The secondary objective was to investigate the possible role of the reduction of dissociative symptoms in the improvement of ED-specific psychopathology following treatment in patients with moderate/severe CM.

2 | METHOD

This quasi-experimental, multicenter trial was conducted at the Psychiatry Unit of the University of Florence and at the ASST Santi Paolo e Carlo (Milan) on a sample of patients with AN and a history of moderate/severe CM. These patients were treated with CBT-E only (Early Trauma CBT Group) or with a combination of CBT-E and EMDR (Early Trauma CBT + EMDR Group). To

compare the longitudinal outcomes of patients with a history of trauma, a control group of patients with AN who did not report moderate/severe CM treated with CBT-E only was also enrolled (No Early Trauma CBT Group).

Enrolment took place between June 2020 and July 2021. All patients enroled provided written informed consent to participate in the study. The ethics committee of the institutions approved the study protocol.

2.1 | Participants

To participate in the study, individuals were required to meet the following inclusion criteria: (1) current diagnosis of AN according to Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5) criteria (American Psychiatric Association, 2013), (2) female sex, and (3) age between 18 and 65 years old. Patients were excluded from the study in presence of (1) any severe medical or psychiatric comorbidity (e.g., psychosis, severe depression, manic episode) that precluded outpatient treatment, (2) illiteracy, (3) intellectual disability, and (4) inability to provide written informed consent. Participation in the study was offered to 156 patients who met the inclusion criteria. Nine of these patients were excluded due to severe comorbidities, and five declined to participate. Of the entire sample, eight patients were recruited from the Milan center (of which four in the Early Trauma CBT Group and four in the Early Trauma EMDR + CBT group), while the remaining patients were recruited from the Florence center.

For a repeated measures analysis of variance (ANOVA) with three longitudinal measurements and three groups, a total sample size of 36 individuals (12 per group) is sufficient to detect a statistically significant within-between interaction (Time*Group) effect with a power of 0.80 ($\alpha = 0.05$). The power analysis was performed using G*Power v3.1.9.7 (Faul et al., 2007). In the absence of preliminary studies on the subject, a detectable minimum effect size of $f = 0.25$ was initially chosen for the sample size calculation, corresponding to an η^2 of 0.06. This value indicates an effect that accounts for 6% of the total variance, generally considered medium in the context of power analysis and a good compromise between the usefulness of results and practicability. These parameters were further corroborated by simulations carried out through WebPower (Zhang, 2018), which confirmed that, in a repeated measures ANOVA with two groups, a minimum sample of 14 individuals per group is sufficient to detect a significant interaction in a scenario like the expected one (decrease of two points of the EDE-Q Total Score vs. one point only, at the last timepoint out

of three, with a baseline value of four and no change at the first follow-up), based on previous research in the field (Cassioli, Rossi, D'Anna, et al., 2022).

Based on these a priori power calculations, the sample enroled in this study was considered adequate.

2.2 | Study design and treatment

The study flowchart is reported in Figure 1. All participants were evaluated at baseline (T0). Then, all patients received a CBT-based multidisciplinary treatment programme, which included regular dietary evaluations and support, periodic psychiatric visits to monitor patients' progress and address any emergent concerns, and individual CBT-E psychotherapy sessions (once or twice a week, depending on treatment phase). Throughout the treatment period, participants were monitored in an outpatient setting. As per exclusion criteria, if any medical conditions requiring hospitalisation in an internal medicine ward were present, participants were withdrawn from the study.

As for the CBT-E protocol, all patients were initially prescribed an extended psychotherapy course of 40 sessions, given their underweight condition. As recommended, two sessions were held per week during the initial treatment period until adequate treatment motivation and initial progress was achieved. After this treatment course, a follow-up evaluation (T1) was conducted. Subsequently, a subgroup of 18 individuals reporting moderate/severe CM received additional treatment with EMDR (Early Trauma CBT + EMDR group), while the remaining patients with a history of CM were placed on a waiting list and continued to receive CBT-E (Early Trauma CBT group). The continuation of CBT-E treatment beyond the initial 40 sessions is also recommended in the official protocol in case of poor response (Fairburn, 2008). Indeed, although CBT-E is typically a time-limited treatment guided by the principle of "parsimony", the protocol explicitly states that there are circumstances of difficulty (e.g., lack or fluctuation of motivation, persistence of ED features that significantly impair functioning and are unlikely to resolve spontaneously towards the end of stage three) where it is more appropriate to extend the duration of treatment, albeit not indefinitely, rather than discontinuing it.

The second follow-up (T2) was performed after 20–25 sessions of EMDR or CBT-E (depending on treatment group). The choice to adopt 20–25 sessions of EMDR instead of the standard 8–10 sessions protocol (which was originally developed for adult post-traumatic stress disorder) was motivated by the fact that patients with CM often report multiple traumatic experiences (Finkelhor
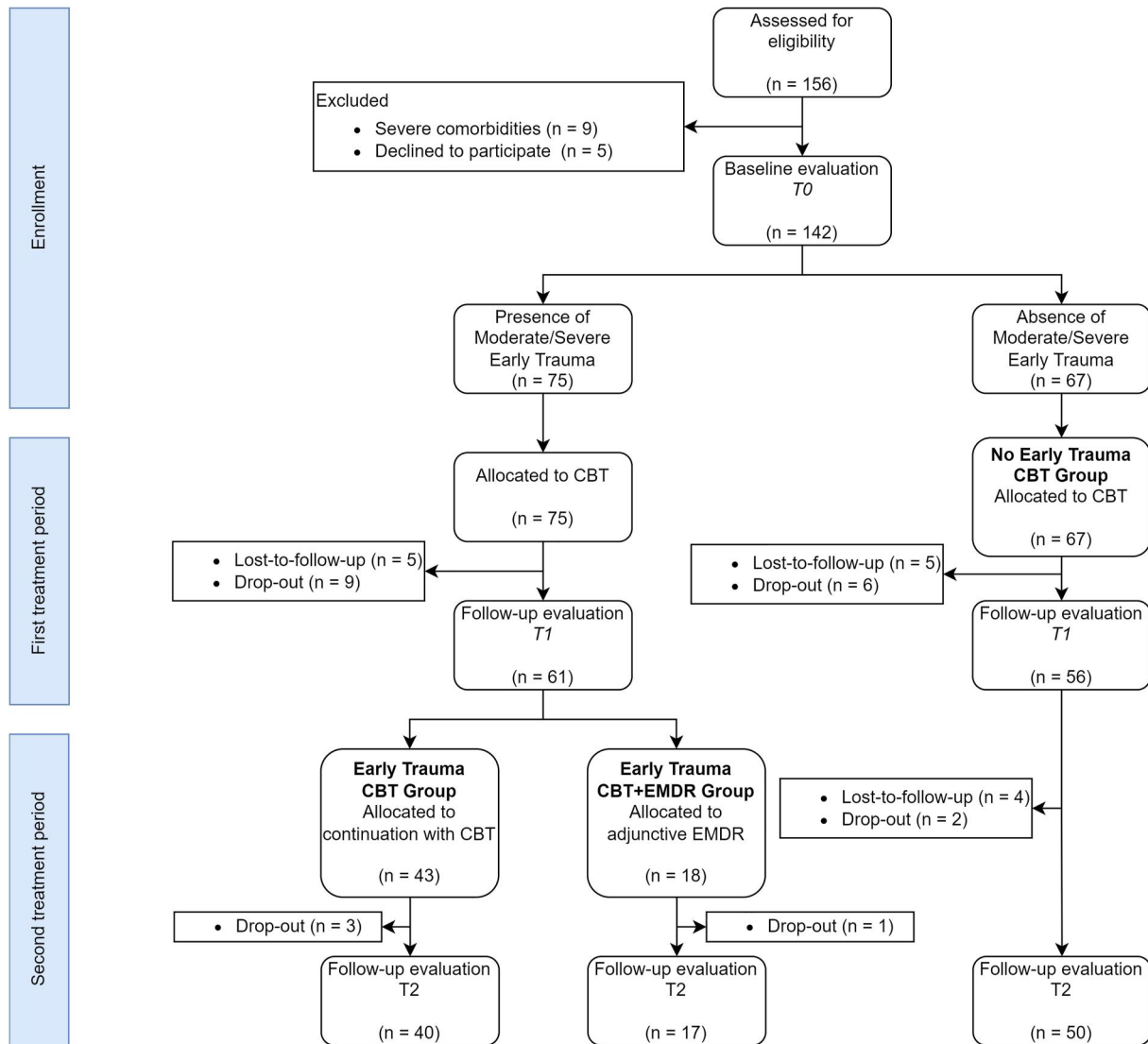
FIGURE 1 Study flow chart.

et al., 2007), and the recommendations of international guidelines acknowledge the necessity to extend the standard protocol when multiple traumas are reported (National Institute for Health and Care Excellence, 2018). Furthermore, several authors stated that a greater number of sessions is needed to target the long-lasting effects of a traumatic event that took place during infancy (Edmond et al., 1999; Van Der Kolk et al., 2007). Aligning with this position, the protocol proposed by Zaccagnino, Civilotti, et al. (2017) for patients with AN involved 32–48 EMDR sessions. The decision to allow for a certain variability in the number of therapy sessions (20–25) is motivated by the fact that the respective manuals of both CBT-E and EMDR acknowledge a certain variation in the number of sessions needed to complete the treatment (Fairburn, 2008; Shapiro, 2018). To mitigate the potential confounding effect arising from the slight variation in the

final number of sessions, this parameter was considered during the statistical analysis. Presence of moderate/severe CM was defined following the definitions provided by the World Health Organisation (World Health Organization, 2022), and was supported by validated psychometric tools as described in paragraph 2.3. As for patients without a history of moderate/severe CM (No Early Trauma CBT group), after the initial treatment with CBT-E, they were monitored through regular outpatient visits and underwent the T2 follow-up evaluation 20–25 weeks after T1, like the other groups. For all groups, regular dietary assessments were also carried out during the second treatment period. The study design included the No Early Trauma CBT group, who received the same CBT-E therapy as patients with CM during the first follow-up period, for three reasons: first, it allowed to confirm one of the study's assumptions, that response to

standard treatments is poor in individuals reporting moderate/severe CM as compared to those not reporting it. Secondly, it confirmed the proper implementation of CBT-E and the treatment protocol in general; without it, the expected limited treatment response in patients with CM could be attributed to low-quality therapy or other uninvestigated covariates. Finally, during the second follow-up, it allowed for a comparison between the treatment outcomes of patients with a history of CM after an extended period of treatment with either EMDR or CBT-E and those without CM, treated with the standard 40-session CBT-E protocol. This helped determine if adding EMDR to the standard treatment is a better choice for eliminating outcome differences between individuals with and without a history of trauma, compared to continuing with the CBT-E protocol as recommended by Fairburn in cases of difficulties (Fairburn, 2008).

Assignment to the CBT + EMDR treatment arm was performed consecutively and until saturation of the availability of therapists. Whenever an EMDR therapy was completed and the therapist had availability to start another, the patient was selected from those who reported moderate/severe CM and were near the end of the first phase of CBT-E treatment. Given that the assignment to treatment groups in this study was performed based on order of arrival, it falls under the category of a quasi-experimental design. Quasi-experimental studies differ from randomized controlled trials (RCTs) in that the study groups are not assigned randomly. This design is frequently utilised in practical settings where randomisation is either impossible or unethical and still provides valuable insights into the effects of an intervention (Campbell & Riecken, 1968).

CBT-E was carried out in line with the CBT-E manual by Christopher Fairburn (2008). As indicated in the CBT-E protocol, during Phase two the possibility of using additional treatment modules for related psychopathology (e.g., clinical perfectionism, mood intolerance, low core self-esteem) was assessed on an individualized basis. Individualized EMDR was tailored to address the client's specific traumatic experiences and conducted in accordance with EMDR protocols and principles (Shapiro, 2018). Particular attention was given to the use of techniques aimed at promoting patient stabilization (e.g., safe place and resource development and installation) during Phase two. Every week, multidisciplinary team meetings and supervisions were held to monitor the correct implementation of the described treatments. All therapists involved in the care of patients were experts in the treatment of EDs and were required to participate in regular supervisions for the treatments they delivered. More in detail, all CBT-E therapists were licensed CBT psychotherapists specifically trained in EDs and the

application of CBT-E, while EMDR therapists were all certified at Level 2 or Practitioner by the European Society of EMDR. Additionally, the CBT supervisors had completed certified courses on CBT-E, whereas the EMDR supervisors were experienced practitioners or supervisors accredited by the European Society of EMDR. Furthermore, it should be noted that the EMDR therapists were not the same individuals who conducted the first phase of treatment with CBT-E.

2.3 | Assessment

At baseline, all patients underwent a comprehensive clinical evaluation performed by an experienced psychiatrist. During the evaluation, demographic and historical data were collected, including age, education level, onset and duration of illness, medical history, and history of CM. Basic anthropometric measurements were also collected, and BMI was calculated using the following formula: $BMI = weight (kg)/height (m)^2$. All participants were administered the validated Italian versions of the following psychometric scales.

- Eating Disorder Examination Questionnaire (EDE-Q) (Calugi et al., 2016): a self-reported questionnaire used to assess ED-specific psychopathology, over the following domains: restraint, eating concern, weight concern, and shape concern. The total score is calculated by summing the scores on each of the four subscales, with higher scores indicating more severe ED symptoms. The Cronbach's alpha of this score was good in the recruited sample ($\alpha = 0.86$).
- Symptom Checklist-90-Revised (SCL-90-R) (Preti et al., 2011): a 90-item self-reported questionnaire used to assess a wide range of psychopathological domains. The Global Severity Index (GSI) is a summary score calculated by taking the mean of all 90 symptoms rated on a 5-point scale, and it has been shown to be a reliable and valid overall measure of psychological distress. The Cronbach's alpha calculated on the present sample was excellent ($\alpha = 0.97$).
- Dissociative Experiences Scale-II (DES-II) (Garofalo et al., 2015): a widely used self-reported questionnaire to assess dissociative symptoms (including experiences of depersonalisation, derealisation, amnesia), that consists of 28 items each rated on a 0 to 100 scale. The total score obtained from the DES-II questionnaire is calculated by averaging the scores of all 28 items. A higher score indicates a higher frequency and severity of dissociative symptoms. This measure demonstrated excellent internal consistency in this study, with a Cronbach's alpha of 0.94.

- Childhood Trauma Questionnaire (CTQ) (Sacchi et al., 2018): a self-reported questionnaire that consists of 28 items, each rated on a 5-point scale, to assess exposure to adverse events during childhood and early adolescence. The questionnaire investigates five types of early adverse experiences: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The total score obtained from the CTQ is calculated by summing the scores of all subscales. A higher score indicates a higher frequency and severity of childhood trauma. The CTQ has validated cutoffs for each subscale that enable the classification of CM exposure into severity categories. The following values, pertaining to the moderate/severe category of CM, were utilised to support the anamnestic assessment of CM exposure and the inclusion of patients in the respective groups: ≥ 13 for Emotional Abuse, ≥ 10 for Physical Abuse, ≥ 8 for Sexual Abuse, ≥ 15 for Emotional Neglect, and ≥ 10 for Physical Neglect (Bernstein & Fink, 1998). The internal consistency was excellent in the recruited sample, as indicated by a Cronbach's alpha of 0.95.

The follow-up assessments (T1, T2) included a comprehensive clinical evaluation, the measurement of BMI and the administration of EDE-Q, SCL-90-R, and DES.

2.4 | Statistics

Continuous variables were reported using means and standard deviations, whereas categorical variables were reported using frequencies and percentages. Age-adjusted Analysis of Covariance (ANCOVA) for continuous variables and logistic regression for categorical variables were used to compare treatment groups at all timepoints. Age-adjusted ANCOVA models were also used to perform comparisons between patients with CM who dropped out of treatment and those who completed it. Post hoc analyses were conducted using Tukey's method. Longitudinal analyses were performed using linear mixed models with random intercepts. All models included Time and Group fixed effects to examine changes in the study variables over time while accounting for potential differences between treatment groups. Time*Group interaction effects were also entered in the models, to determine if the time-course differed between treatment groups (moderation analysis). Statistically significant interaction effects were further analysed using simple slopes analysis. In the context of moderation analyses, the simple slopes analysis allows for probing of interactions in such a way as to verify the effect of a dependent variable (in this case Time) for each level of the moderator (in this case Group). For each treatment group, variations at each follow-up compared to the baseline were therefore tested, to verify whether the improvement compared to T0 was significantly different from zero.

Longitudinal models were adjusted for the total number of psychotherapy sessions received at each follow-up. All analyses were performed on patients who had completed the proposed treatment course. To assess whether the exclusion of non-completers had a significant impact on the results, sensitivity analyses were performed by repeating longitudinal analyses on the whole sample using all available data (missing data were handled using mixed models).

Finally, a longitudinal mediation analysis was conducted on the subsample of patients with a history of moderate/severe CM to examine the a priori hypothesis that the reduction in ED-specific psychopathology was mediated by the longitudinal improvement in dissociative symptoms. Considering that changes in dissociative symptomatology were anticipated only during the second treatment period, the analysis was performed on the T2-T0 change scores, following the two-condition within-participant statistical mediation framework as outlined by Montoya & Hayes (2017). The statistical significance of the mediation was determined by computing the 95% confidence interval of the indirect effect using bias-corrected bootstrapping with 10,000 resamples. The effect was considered significant if the confidence interval did not include zero. This model was computed on the entire subsample of patients with CM, assuming a common mediation mechanism for all traumatised patients, irrespective of the treatment received. To further support this assumption, an additional sensitivity analysis was performed to assess any significant improvement in the model when computing the regression coefficients separately for the two treatment groups, using the Chi-squared comparison test with the Satorra-Bentler scaled Chi-square.

Statistical analyses were performed using R statistical software version 4.3.0 (R Core Team, 2023) and the following libraries: ggplot2 (Wickham, 2016), lavaan (Rosseel, 2012), nlme (Pinheiro et al., 2020), reghelper (reghelper, 2020).

3 | RESULTS

A total of 142 patients with AN were enroled, of which 75 reported a history of early trauma and obtained scores in at least one CTQ subscale that were indicative of moderate/severe CM exposure. All patients were initially treated with a multidisciplinary CBT-based approach for

an average of 10.6 months. During this period, 25 patients either dropped out of treatment or were lost to follow-up, while the rest were re-evaluated (T1 follow-up) (Figure 1). After this initial therapy, a subsample of 18 patients with a history of CM received an additional EMDR treatment (Early Trauma CBT + EMDR Group), while the remaining 43 patients reporting CM continued to receive the same CBT-based treatment (Early Trauma CBT Group). The T2 follow-up evaluation was conducted after an average of 15.4 months from baseline. Three patients in the Early Trauma CBT group and one in the EMDR group dropped out of treatment ($\chi^2 = 0.04$, $p = 0.838$). Among patients with CM, no significant difference was found between treatment completers and non-completers regarding baseline characteristics (see Supplementary Table 1). Throughout the entire treatment period, no adverse events or unexpected reactions to the treatment occurred in either group.

Table 1 reports the sample characteristics and psychometric data for patients who completed the last follow-up evaluation, divided by treatment group. The baseline characteristics of patients who received EMDR adjunctive therapy did not differ from those in the Early Trauma CBT group (all $p > 0.05$, Table 1). Patients without a history of moderate/severe CM showed less severe baseline characteristics, including shorter illness duration, lower levels of general and ED-specific psychopathology, and less dissociative symptomatology (Table 1).

The results of the longitudinal linear mixed model analyses for BMI and psychometric variables are reported in Table 2. Figure 2 presents the longitudinal trends and results of the simple effects analysis, which highlights statistically significant variations at each follow-up compared to the baseline values. At the first follow-up evaluation after the initial CBT-only treatment period (T1), there was no significant improvement in patients reporting early trauma, in terms of BMI, ED-specific and general psychopathology, and dissociative symptomatology (Figure 2), as indicated by non-significant Time and Time*Group effects (b_{CBT_T-T1} and $b_{EMDR*T1}$, Table 2). However, at the last follow-up evaluation (T2) patients reporting early trauma showed improvements in terms of recovery of BMI (Figure 2a) and decrease in ED-specific symptoms (Figure 2b). As demonstrated by statistically significant interaction effects ($b_{EMDR*T2}$, Table 2), patients with moderate/severe CM who received EMDR showed greater BMI recovery and lower EDE-Q total scores compared to those who continued CBT therapy alone. Moreover, patients in the Early Trauma CBT + EMDR group reported a significant reduction in levels of general psychopathology and dissociative symptoms at T2 (Figures 2c and 2d respectively), which was not present in either CBT groups (Table 2).

Regarding the patients with AN without moderate/severe CM, weight restoration and a decrease in ED-specific psychopathology were observed at T1 and maintained at the T2 follow-up (Figures 2a and 2b, respectively). The SCL-90-R GSI and DES scores, which were already significantly lower at baseline compared to the other groups (as also indicated by the significant b_{CBT_NT-T0} effects, Table 2), did not show a significant reduction at T2 (Figure 2).

The post-hoc comparisons conducted among the various treatment groups at the final follow-up (T2) demonstrated that there were no differences in outcome variables between the group of patients with CM who received CBT + EMDR and the group of patients without a history of early trauma (Table 1). Conversely, the patients with CM treated only with CBT exhibited lower improvements in terms of body weight and ED psychopathology as compared to the EMDR group (Table 1), and persistent higher levels of general psychopathology and dissociative symptoms than patients without CM (Table 1).

The inclusion of treatment non-completers did not significantly change the results, as evidenced by sensitivity analyses that showed similar results to those reported above when including all available data from the entire sample.

Finally, the mediation analysis, performed solely on the subsample of patients with moderate/severe CM, provided evidence for a significant longitudinal indirect effect (Figure 3). Specifically, the analysis revealed that the longitudinal improvement in ED-specific psychopathology was mediated by the reduction in dissociative symptoms (Figure 3). The results of the sensitivity analysis indicated that conducting separate regression analyses for both treatment groups did not lead to a statistically significant improvement in the model performance, as supported by the non-significant Chi-squared difference test ($\Delta\chi2 = 0.01$, $p = 0.903$). This finding suggests that there was no indication that the mechanisms underlying the mediation were different between the two groups, supporting the idea that lower improvements in dissociation symptoms (as observed in the CBT-only treatment group) were correlated with lower improvements in ED-specific psychopathology, and vice-versa (as observed in the CBT + EMDR addon group).

4 | DISCUSSION

This is the first study that evaluated the effect of the add-on of EMDR intervention to CBT-E in patients with AN reporting a history of moderate/severe CM. Even though

TABLE 1 Descriptive statistics of socio-demographic, clinical and psychometric variables collected in the study, divided by treatment group at each timepoint.

	Early trauma CBT group n = 40			Early trauma CBT + EMDR group n = 17			No early trauma CBT group n = 50			Group differences (F-values)		
	T0	T1	T2	T0	T1	T2	T0	T1	T2	T0	T1	T2
Age (years)	25.54 ± 9.78	-	-	25.12 ± 11.40	-	-	22.84 ± 8.66	-	-	0.71	-	-
Education (years)	12.38 ± 2.62	-	-	12.10 ± 2.51	-	-	12.62 ± 2.52	-	-	0.31	-	-
Age of onset (years)	17.37 ± 4.04	-	-	15.25 ± 4.87	-	-	17.80 ± 4.10	-	-	2.51	-	-
Illness duration (years)	8.52 ± 9.93	-	-	9.39 ± 10.43	-	-	4.52 ± 7.13[a]	-	-	4.44*	-	-
AN-BP subtype	29 (72.5)	-	-	12 (70.6)	-	-	29 (58.0)	-	-	4.78	-	-
BMI (kg/m²)	16.82 ± 1.36	17.03 ± 1.93[c]	18.13 ± 2.01[b]	16.97 ± 1.80	17.18 ± 1.79	19.69 ± 1.59	16.73 ± 1.40	18.34 ± 1.90	18.52 ± 1.92	0.18	3.45*	3.20*
EDE-Q total score	4.26 ± 1.11	4.07 ± 0.91	3.20 ± 1.72[b]	4.33 ± 1.45	4.23 ± 1.63	1.97 ± 1.87	3.27 ± 1.67[a]	2.35 ± 1.77[a]	2.19 ± 1.84	6.88**	6.64**	3.51*
SCL-90-R GSI	1.95 ± 0.52	1.92 ± 0.54	1.64 ± 0.93[c]	2.20 ± 0.67	2.12 ± 0.81	1.22 ± 0.86	1.38 ± 0.70[a]	1.01 ± 0.66[a]	1.02 ± 0.75	16.91***	18.94***	3.39*
DES total score	33.60 ± 16.89	37.57 ± 15.93	26.43 ± 21.00[c]	38.16 ± 18.68	38.57 ± 16.93	18.42 ± 12.21	16.64 ± 12.27[a]	14.73 ± 17.38[a]	13.03 ± 10.36	16.20***	13.60***	3.61*
CTQ total score	71.96 ± 20.68	-	-	79.75 ± 24.38	-	-	29.82 ± 4.38[a]	-	-	94.32***	-	-

Abbreviations: AN-BP, Anorexia Nervosa Binge-Eating/Purging Type; BMI, Body Mass Index; CBT, Cognitive Behavioural Therapy; CTQ: Childhood Trauma Questionnaire; DES, Dissociative Experiences Scale; EDE-Q, Eating Disorder Examination Questionnaire; EMDR, Eye Movement Desensitisation and Reprocessing; SCL-90-R, Symptom Checklist-90-Revised.

[a]Significantly different from the other groups (p < 0.05).

[b]Significantly different from the Early trauma CBT + EMDR Group (p < 0.05).

[c]Significantly different from the No Early Trauma CBT Group (p < 0.05).

TABLE 2 Longitudinal linear mixed model analysis results.

	Intercept	Group effect		Time effect		Time*Group interaction effect			
		T0 $b_{EMDR-T0}$	T0 b_{CBT_NT-T0}	T1 b_{CBT_T-T1}	T2 b_{CBT_T-T2}	T1 $b_{EMDR*T1}$	T2 $b_{EMDR*T2}$	T1 b_{CBT_NT*T1}	T2 b_{CBT_NT*T2}
BMI (kg/m^2)	16.88***	0.29	−0.14	0.12	0.94**	−0.08	1.40*	1.31**	0.76
EDE-Q total score	4.26***	0.12	−0.99**	−0.35	−1.15***	0.18	−1.34*	−0.60	−0.06
SCL-90-R GSI	1.95***	0.24	−0.58***	0.01	−0.20	0.07	−0.65**	−0.29	−0.03
DES total score	36.03***	3.96	−20.04***	−2.37	−6.89	2.20	−11.60*	2.95	5.74

Note: Intercepts and unstandardised coefficients for the fixed effects of Group (compared to Early Trauma CBT group), Time (compared to T0), and Group*Time interactions are reported.

Abbreviations: BMI: Body Mass Index, CBT: Cognitive Behavioural Therapy, CBT_NT: No Early Trauma CBT group, CBT_T: Early Trauma CBT group, DES: Dissociative Experiences Scale, EDE-Q: Eating Disorder Examination Questionnaire, EMDR: Eye Movement Desensitisation and Reprocessing, SCL-90-R: Symptom Checklist-90-Revised.
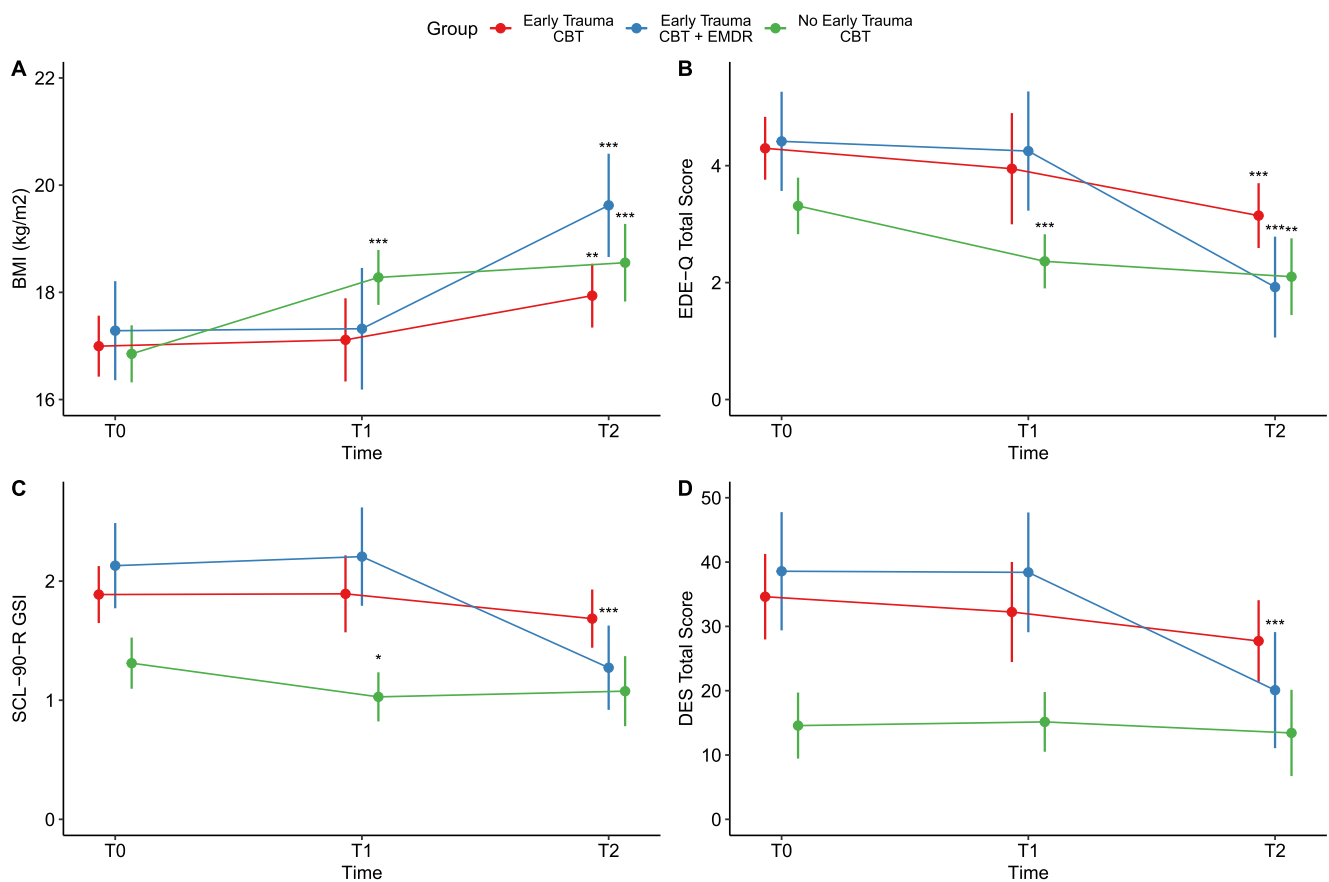

FIGURE 2 Longitudinal trends of BMI (panel A), eating disorder psychopathology (panel B), general psychopathology (panel C) and dissociative symptoms (panel D), with results of the simple effects analysis. Significant differences from baseline are indicated as follows: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. BMI, Body MassIndex; CBT, Cognitive Behaviour Therapy; DES, Dissociative Experiences Scale; EDE-Q, Eating Disorder Examination Questionnaire; EMDR, Eye Movement Desensitisation and Reprocessing; SCL-90-R GSI, Symptom Checklist-90-RevisedGlobal Severity Index.

preliminary given the small sample size, these results seem to support the a priori hypothesis that integrating CBT-E with EMDR in this subpopulation of patients with AN would enhance the effectiveness of treatment.

Specifically, on average, patients with a history of moderate/severe CM in the CBT + EMDR group reported better outcomes in terms of weight recovery and reduction of ED-specific psychopathology after treatment, as
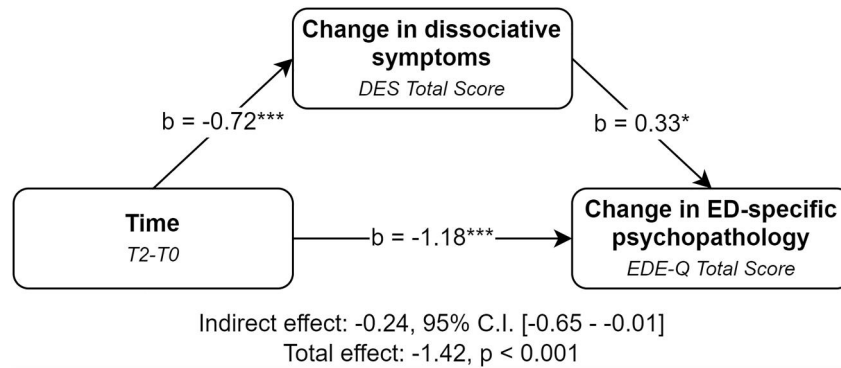
FIGURE 3 Longitudinal mediation model, with the decrease in dissociative symptomatology over time mediating the improvement of Eating Disorder (ED)-specific psychopathology at follow-up. Unstandardised effects are reported, along with their respective *p*-values indicated as follows: *$p < 0.05$, ***$p < 0.001$. BMI, Body Mass Index; CBT, Cognitive Behaviour Therapy; DES, Dissociative Experiences Scale; EDE-Q, Eating Disorder Examination Questionnaire; EMDR, Eye Movement Desensitisation and Reprocessing; SCL-90-R GSI, Symptom Checklist-90-Revised Global Severity Index.

compared to those treated with CBT-E only. Additionally, only those in the CBT + EMDR group showed a significant reduction in the levels of general psychopathology and dissociative experiences at follow-up, and end-of-therapy comparisons demonstrated that the add-on of EMDR, but not the continuation of additional CBT sessions, eliminated the differences in outcomes compared to patients without a trauma history treated with 40 sessions of CBT-E. The longitudinal mediation model showed that the reduction of dissociative symptoms mediated the amelioration of ED-specific psychopathology in patients reporting moderate/severe CM.

Consistent with the hypothesis of the existence of a maltreated eco-phenotype of EDs, characterised by greater clinical severity and different response profile to treatments (Day et al., 2023; Molendijk et al., 2017; Monteleone et al., 2021), patients with a history of moderate/severe CM showed greater severity in every assessed area at baseline, and did not show symptom improvements after 40 sessions of CBT-E, unlike patients without a history of CM. Previous studies highlighted that the area most at risk of non-response after treatment was general psychopathology rather than specific ED symptoms (Castellini et al., 2018; Lelli et al., 2019). The absence of substantial improvements in terms of ED psychopathology observed in this study at the first follow-up is consistent with what Cassioli et al. reported regarding the diminishing response to CBT-E as the severity of the experienced CM increased (Cassioli, Rossi, D'Anna, et al., 2022). Indeed, the criterion for assignment to the moderate/severe trauma group was much more stringent in this study compared to that used in other available studies (Calugi et al., 2018; Castellini et al., 2018; Lelli et al., 2019), taking into consideration a

severity threshold and the subjective experience of the traumatic events and not just the presence/absence of early trauma. The improvements in terms of ED-specific symptoms and BMI at T2, after the addition of further sessions of CBT-E, is in line with what was stated by Fairburn about the importance of giving the person more time to work on the ambivalence regarding motivation for change and to implement the therapeutic path in the presence of difficulties (Fairburn, 2008). However, it should be noted that even with the addition of more sessions, CBT-E alone was not effective in ameliorating general and dissociative psychopathology in patients reporting moderate/severe CM, whereas the combination of CBT-E + EMDR determined an improvement in these areas as well. This is crucial considering that psychiatric comorbidity represents a significant risk factor in determining a relapse of the ED (Sala et al., 2023). Additionally, the CBT-E + EMDR group underwent better improvements in terms of ED-specific psychopathology and weight recovery, confirming previous studies evaluating the efficacy of EMDR on ED symptoms (Bloomgarden & Calogero, 2008; Ergüney-Okumuş, 2021; Zaccagnino et al., 2017a, 2017b). Furthermore, between groups comparisons at the end of therapy showed that only the traumatised group treated with the add-on of EMDR exhibited similar levels of psychopathology and weight recovery, as compared to individuals without a trauma history treated with the standard 40-session CBT-E protocol. Thus, it is possible to speculate that the add-on of EMDR eliminated the trauma-specific gap in the longitudinal course of psychopathology and weight recovery.

Overall, these results highlighted the importance of integrating interventions that specifically target ED

psychopathology with trauma-focused therapies in patients with a history of moderate/severe CM. This approach represents a change in perspective compared to the recommendations of the commonly adopted cognitive-behavioural approach. According to this perspective, even when progress is slow or difficult, it is advisable to persevere with CBT-E while trying to understand and address the basis for the lack of progress rather than changing the treatment approach (Fairburn, 2008). Moreover, the CBT-E model predominantly focuses on behaviours and cognitions relating to EDs, lacking a developmental perspective on these conditions, and only tangentially considering the potential influence of early trauma (Fairburn, 2008). On the other side, these results are in line with what is reported by recent studies highlighting the importance of expanding the classic paradigm when dealing with patients who report a history of trauma (Mitchell et al., 2021). In particular, Mitchell et al. emphasised that the cognitive-behavioural formulation of EDs should be expanded when post-traumatic symptomatology is present, as there is a bidirectional relationship between ED-specific and post-traumatic symptoms (Mitchell et al., 2021). For example, trauma-related self-beliefs of criticism, low self-esteem, or self-punishment might enhance concerns about controlling body shapes and weight (Mitchell et al., 2021). Furthermore, dietary restriction may represent a way to regain a sense of control on one's body after trauma exposure (Trim et al., 2017), and binge-eating may be reinforced as a coping mechanism for dysregulated trauma-related emotions (Feinson & Hornik-Lurie, 2016). Therefore, it can be hypothesised that the effectiveness of EMDR in improving both ED-specific symptoms, including weight recovery, and general psychopathology, is due to its efficacy towards trauma-related symptoms through reprocessing traumatic memories at cognitive, emotional, and bodily levels, consequently reducing their negative impact on the patient's self-representations and behaviours. In particular, the results of this study underlined that the reduction of dissociative symptoms induced by EMDR may represent a fundamental mechanism underlying its effectiveness in patients with AN and a traumatic history. In fact, the mediation analysis suggested that, in patients with a history of moderate/severe CM, part of the longitudinal reduction of ED-specific psychopathology occurred through the amelioration of dissociative symptoms following treatment. The effectiveness of EMDR on dissociation is well-documented by the existing literature (Atchley & Bedford, 2021; Carletto et al., 2018; Knipe, 2018; Van Minnen et al., 2016), and the role of this dimension in maintaining ED psychopathology in the presence of a history of childhood trauma is increasingly

supported (Longo et al., 2020, 2021, 2023; Rabito-Alcón et al., 2021).

Although these findings are promising, it is crucial to emphasise that the application of EMDR therapy in patients with a history of severe traumatic experiences during childhood, accompanied by substantial impairments in functioning and dissociation, should be approached with caution. Specifically, it is imperative to consider the necessity of conducting an adequate stabilisation phase (Phase two) before starting trauma processing. Indeed, in the present study patient stabilisation was ensured not only through the implementation of techniques recommended by the EMDR protocol (e.g., safe place, resource development and installation), but also through the provision of treatment within a multidisciplinary care context, and the application of a sequential protocol where trauma-focused work occurred after several weeks of CBT-E treatment.

The strengths of this study include the enrolment of patients from a specialised public service for EDs which potentially included those with more severe psychopathology and less motivation for treatment compared to other contexts, and robust methodology featuring double trauma history evaluation and sensitivity analyses. Longitudinal models were adjusted to the treatment period of each patient, mitigating the slight variability in the number of therapy sessions. Additionally, the study considered multiple outcomes, including BMI and trauma-related symptoms like dissociative experiences. Despite these strengths, several limitations should be noted, such as the limited sample size and follow-up duration, the absence of preliminary protocol registration, and potential selection bias due to the non-randomized assignment of patients to the different interventions. Nonetheless, it is important to note that baseline comparisons between treatment groups did not reveal any statistically significant difference, which reduced the probability of this potential bias. Moreover, quasi-experimental studies also have significant advantages, given the possibility to investigate real-world therapies in a more naturalistic setting. Future studies should expand the sample size and follow-up duration and verify the present findings through registered randomized controlled trials (RCTs). Moreover, implementing intermediate assessments after initial EMDR therapy sessions could potentially enhance future protocols. Finally, it should be noted that while the multicenter nature of this study could have introduced greater heterogeneity, it also contributed to the generalisability of the findings.

In conclusion, this study demonstrated the potential benefit of adding EMDR to the existing CBT-E treatment for patients with AN who have a history of moderate/

severe CM, suggesting that a combination of trauma-focused interventions and CBT-E could be a more effective treatment for this specific group of patients. While recent studies mainly focused on investigating separate intervention strategies for EDs (Grenon et al., 2019; Vogel et al., 2021), this study proposes a different approach that involves integrating multiple models, tailored to the specific patient's needs. This is because different interventions may target distinct but equally important psychopathological dimensions. By combining different approaches, the resulting treatment plan may be more comprehensive and effective for individuals with complex mental health needs.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualisation: Eleonora Rossi, Emanuele Cassioli and Giovanni Castellini; Data curation: Eleonora Rossi, Emanuele Cassioli, Lucia Cecci, Francesca Arganini, Michela Martelli, Carolina Alberta Redaelli, Simona Anselmetti and Sara Bertelli; Formal analysis: Emanuele Cassioli; Investigation: Eleonora Rossi, Emanuele Cassioli, Lucia Cecci, Carolina Alberta Redaelli, Simona Anselmetti and Sara Bertelli; Methodology: Eleonora Rossi and Emanuele Cassioli; Project administration: Eleonora Rossi, Emanuele Cassioli, Francesca Arganini, Michela Martelli, Carolina Alberta Redaelli, Simona Anselmetti, Sara Bertelli, Valdo Ricca and Giovanni Castellini; Resources: Sara Bertelli, Valdo Ricca and Giovanni Castellini; Software: Emanuele Cassioli; Supervision: Eleonora Rossi, Emanuele Cassioli, Carolina Alberta Redaelli, Simona Anselmetti, Sara Bertelli, Isabel Fernandez, Valdo Ricca and Giovanni Castellini; Validation: Eleonora Rossi, Emanuele Cassioli, Isabel Fernandez and Giovanni Castellini; Visualisation: Eleonora Rossi and Emanuele Cassioli; Writing – original draft: Eleonora Rossi and Emanuele Cassioli; Writing - review & editing: Eleonora Rossi, Emanuele Cassioli, Lucia Cecci, Francesca Arganini, Michela Martelli, Carolina Alberta Redaelli, Simona Anselmetti, Sara Bertelli, Isabel Fernandez, Valdo Ricca and Giovanni Castellini.

CONFLICT OF INTEREST STATEMENT

IF is the president of the EMDR Europe and Italian Associations.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Valdo Ricca (iD) https://orcid.org/0000-0002-9291-2124
Giovanni Castellini (iD) https://orcid.org/0000-0003-1265-491X

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