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Early maladaptive schemas mediate the relationship between severe childhood trauma and eating disorder symptoms: evidence from an exploratory study

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Abstract

Background Childhood trauma history has frequently been linked to eating disorders (EDs); nevertheless, the scientific literature calls for extending knowledge regarding mediators between EDs and childhood trauma. This study explored whether ED symptoms and early maladaptive schemas were more severe in ED patients with severe childhood trauma than in ED patients with no/mild childhood trauma and whether early maladaptive schemas mediated the relationship between childhood trauma and ED symptom severity.

Methods Data were extracted from the Regional Centre for Eating Disorders registry at the University Hospital of Verona. The extracted data included self-reported data, including the Eating Disorder Inventory-3 score, Young Schema Questionnaire score, Childhood Experience and Experience of Care and Abuse Questionnaire score, and sociodemographic and clinical information on the ED outpatients seeking care. A mediation analysis using the structural equation modeling procedure was conducted.

Results Forty-two outpatients, 31% of whom exhibited severe childhood trauma, satisfied the criteria for registry data extraction. The severity of ED symptoms, as well as the early maladaptive schemas' scores for emotional deprivation, defectiveness, failure, vulnerability, insufficient self-control, and negativity, were greater in ED outpatients with severe childhood trauma. Furthermore, early maladaptive schemas related to defectiveness, failure, and negativity had a mediating role in the relationship between severe childhood trauma and ED symptom severity.

Conclusions This exploratory study provides preliminary evidence about the importance of early maladaptive schemas in the relationship between trauma history and ED psychopathology. In addition, ED symptoms may represent a dysfunctional attempt to avoid unpleasant emotions associated with schema activation. The results support the need to consider early maladaptive schemas in the treatment of traumatized patients with ED symptoms. Study limitations, research and clinical implications are discussed.

Keywords Eating disorders, Childhood trauma, Early maladaptive schemas, Outpatients, Psychopathology

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Plain English summary

Eating disorder psychopathology was found to be related to a history of trauma. Nonetheless, our understanding of the mediators of the relationship between childhood trauma and eating disorders remains to be improved. The current study revealed that certain early maladaptive schemas (i.e., defectiveness, failure, and negativity) mediated the relationship between childhood trauma and eating disorder symptoms and that outpatients who experienced severe childhood trauma reported more severe eating disorder symptoms and greater severity of certain early maladaptive schemas, such as emotional deprivation, defectiveness, failure, vulnerability, insufficient self-control, and negativity. Our findings support the need to consider early maladaptive schemas in the treatment of traumatized patients with eating disorders.

Background

Eating disorders (EDs) are disabling, fatal, and costly mental disorders that severely affect physical health and disrupt psychosocial functioning [1]. The Diagnostic and Statistical Manual of Mental Disorders, fifth edition, Text Revision (DSM-5-TR) categorizes EDs into the following broad categories: anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), and avoidant/restrictive food intake disorder (ARFID), with other specified feeding or eating disorders (OSFED) and unspecified feeding or eating disorders (UFED) as additional categories [2]. The ED incidence has increased globally, from 3% in 2000–2006 to 8% in 2013–2018 [3]. Since the COVID-19 outbreak, ED rates have continued to rise, as indicated by the increasing incidence of ED diagnoses, primarily in young people [4]. Moreover, a considerable number of patients persist in having ED symptoms at long-term follow-up, affecting the health and quality of life of patients and their caregivers [1].

A complex interplay between psychosocial and biological factors sustains the development and maintenance of EDs [5]. Several studies have reported an increased likelihood of trauma in ED patients [6–8], with a lifetime incidence ranging from 21 to 67% [9, 10]. Specifically, sexual trauma remains the most well-documented symptom in this clinical population, with a lifetime prevalence ranging from 6 to 64% [11–13]. Furthermore, physical and emotional abuse [14, 15], emotional and physical neglect [16–18], teasing, bullying [9, 19], and loss [9] were also reported in ED patients, even though the findings were mixed. Caslini and colleagues (2016) conducted a systematic review and meta-analysis and revealed that emotional abuse and sexual abuse were strongly correlated with BN and binge eating disorder (BED) [8]. In contrast, physical abuse was linked to any kind of ED. These findings have also been confirmed by subsequent studies [16, 20].

Research on psychological trauma has widely emphasized the dose–response effect between adverse childhood experiences and outcomes, recognizing the impact

of the cumulative trauma (i.e., exposure to multiple types of adversities) on mental health [21, 22]. Nonetheless, not all individuals who experienced childhood adversity reported long-term health effects and the need for mental health treatment [21]. Recent studies questioned whether the frequency of adverse childhood experiences might truly account for the severity of ED psychopathology, giving more relevance to symptoms of complex post-traumatic stress disorder (CPTSD) [23] or perception of trauma severity [7, 24]. In fact, it has been shown that posttraumatic stress disorder (PTSD) symptoms and CPTSD symptoms have a long-lasting effect on health [25, 26]. Despite ongoing debate in the literature concerning the optimal indicators of trauma burden on ED psychopathology, several studies reported the cumulative effect of traumatic exposure on ED symptoms [27–29], treatment outcomes [11], and clinical severity in both adult and adolescent populations [10, 13, 30].

Furthermore, ED symptoms have been associated with dysfunctional parental bonding, characterized by low care [31], high parental overprotection [32], and attachment insecurity [33]. Factors such as parental mental health, child temperament, social and economic conditions, and competing care demands, may exert influence on the development of secure attachment relationships [34–36]. Within the framework of attachment theory [37], the quality of early repeated parent–child interactions has a substantial impact on how individuals interact with the world, perceive themselves and others, and regulate emotions [38], affecting psychosocial development and mental health outcomes [39]. Therefore, aversive and neglectful repeated parent–child relationships, in which the central attachment figure itself is the source of intense distress, may undermine the perception of the world as a secure place, the possibility of creating trusting relationships with others, and the ability to modulate intense affect, provoking overwhelming emotions that have a traumatic impact on the individual [40]. Consequently, the presence of multiple traumatic factors, such as childhood abuse and dysfunctional parental bonding,

was associated with a greater trauma burden, which had an impact on long-term mental health [41] as well as ED symptoms [33, 38]. As a result, it has been suggested that ED symptoms are a maladaptive mechanism for controlling trauma-related adverse emotions [30, 42].

Early negative experiences in the context of attachment bonds are often associated with long-lasting changes in emotional and cognitive processing (i.e., expectancies and beliefs about the self, others and the world) [43]. These early negative events could contribute to developing maladaptive cognitive and emotional patterns known as Early Maladaptive Schemas (EMSs) during childhood or adolescence [44, 45]. EMSs develop as representations of the early child’s environment; they influence the elaboration of later experiences and persist throughout life, directing actions and social interactions with other people [46], as well as shaping personality development [47]. During adulthood, these schemas can be activated by life events perceived as similar to adverse experiences experienced during childhood, and the activation of these schemas is associated with an increase in emotional arousal [46]. Young [46] described 18 EMSs grouped into five broad domains (see Table 1). A number of psychiatric conditions, including eating disorders, obsessive–compulsive disorders, psychosis, anxiety, affective disorders, and posttraumatic stress disorder (PTSD), have been connected to EMSs [43]. Patients with a history of trauma frequently reported EMSs from the domain of disconnection/rejection [48], such as emotional deprivation, social isolation [49], mistrust/abuse and defectiveness/shame [50]. The disconnection/rejection domain also mediates the relationship between childhood trauma and mental

disorders such as depression [51], PTSD [52] and EDs [53]. A systematic review revealed that EMS ‘unrelenting standards’ were significant across all ED diagnoses, while EMS ‘insufficient self-control’ was only associated with ED diagnoses characterized by binge eating and purging symptoms [54]. Moreover, BED severity was linked to emotional deprivation and defectiveness, which are both included in the EMS domain of rejection/disconnection [55]. Understanding the mediating role of EMSs in the relationship between childhood trauma and ED psychopathology is critical for identifying further factors that need to be clinically considered and enhancing treatments targeted for ED patients with a history of trauma. Nevertheless, this research field is still in its infancy; in fact, to the best of our knowledge, the mediating role of the 18 specific EMSs has not been extensively investigated [53, 56]. Moreover, a recent systematic review conducted by Rabito-Alcon et al. [57] highlighted the need to extend knowledge regarding mediators between ED and childhood trauma.

Considering that multiple traumatic experiences have shown a cumulative effect on the severity of the clinical presentation [28, 58], the objectives of the current study were to (1) compare the Eating Disorder (ED) symptom severity (assessed during the first admission to the Regional Centre for Eating Disorders) and early maladaptive schema (EMS) scores of patients with severe childhood trauma to those with no/mild childhood trauma; (2) investigate the mediating role of EMSs on the relationship between childhood trauma and ED symptom severity. As mentioned above, trauma burden increases when a person experiences multiple traumatic factors;

Table 1 Description of early maladaptive schemas and schema domains

| Schema domain | Description of the domain | Early maladaptive schema (EMS) |
|-------------------------------|--|---|
| Disconnection/rejection | The belief that one’s needs for security, nurturance and empathy will not be satisfied | Abandonment Mistrust/abuse Emotional deprivation Defectiveness/Shame Social isolation |
| Impaired autonomy/performance | The belief that one’s ability to survive and cope autonomously or perform successfully is impaired | Dependence Vulnerability Enmeshment Failure |
| Impaired limits | Difficulties in controlling impulses, obeying rules, and practicing goal-directed behaviors | Entitlement Insufficient self-Control |
| Other-directedness | The needs, desires and responses of other people are overvalued and considered instead of their own needs | Subjugation Self-sacrifice Approval-seeking |
| Overvigilance and inhibition | The spontaneous emotions and drives are repressed and displaced by inflexible internalized norms about performance and conduct | Negativity Emotional Inhibition Unrelenting Standards Punitiveness |

as a consequence, in the present study, severe childhood trauma was defined as having experienced both childhood abuse (i.e., either sexual or physical) and dysfunctional parental bonding. In contrast, no/mild childhood trauma was defined as having experienced either childhood abuse (i.e., either sexual or physical), dysfunctional parental bonding, or neither. According to the literature [28, 49, 53, 59], we hypothesized that severe childhood trauma is linked to more severe ED symptomatology and higher EMS scores. Additionally, we hypothesized that the burden of childhood trauma may indirectly influence the severity of ED symptoms through EMSs, particularly those associated with the disconnection/rejection domain.

Methods

Study design and participants

The current research is an observational retrospective study. The data were extracted from the Regional Centre for Eating Disorders (ED) registry at the University Hospital of Verona, which has stored sociodemographic and clinical information on all outpatients seeking care since 2014 and was routinely gathered during the first admission to the Regional Centre. Eligibility criteria for the service provision were as follows: patient's age equal or higher than 14 years old; absence of extreme body mass index (BMI) that requires an inpatient's level of care (i.e., $BMI < 15.00 \text{ kg/m}^2$); health professionals as referral providers (i.e., pediatricians, general practitioners, mental health professionals, etc.). For the current study, we extracted data on outpatients who were admitted to the Regional Centre between 2014 and 2016 using the following criteria: (1) clinical diagnosis of anorexia nervosa (AN), bulimia nervosa (BN) or other specified feeding or eating disorders (OSFED) according to the DSM-5 criteria [60]; (2) absence of significant psychiatric comorbidity, based on clinical assessment; and (3) completion of self-report questionnaires described in "Measures" section. The following types of information were also extracted from the registry: sociodemographic data, including sex, age, education level, and marital status, and clinical data, such as height, weight, and body mass index. The study was conducted in compliance with the Declaration of Helsinki and was approved by the local Ethics Committee (CESC Protocol number 48455 of 8 August 2022).

Measures

The *eating disorder inventory* (EDI-3) [61, 62] is a standardized questionnaire that evaluates current symptoms and psychological characteristics associated with EDs. It consists of 91 items categorized into three subscales of

eating disorder symptoms and nine general psychological subscales, which are relevant but not specific to EDs. The Eating Disorder Risk Composite (EDRC) is obtained by combining the scores from three subscales of ED symptoms (i.e., Drive for Thinness, Bulimia, and Body Dissatisfaction). Regarding psychometric properties, Clausen et al. [63] reported satisfactory internal consistency of the questionnaire (Cronbach's alpha values ranging from 0.75 to 0.92 for ED patients and from 0.59 to 0.93 for normal controls). The Cronbach's alpha for the EDRC scale calculated on the study's patients was 0.82.

The *young schema questionnaire* (YSQ) [64, 65] is a standardized self-report questionnaire consisting of 232 items. These items are organized into 18 clusters, each representing an early maladaptive schema (EMS). These schemas are further categorized into 5 areas: (1) disconnection/rejection; (2) impaired autonomy/performance; (3) impaired limits; (4) other-directedness; and (5) overvigilance/inhibition (see Table 1). Saggino et al. [65] discovered that the Italian version of the instrument demonstrated strong internal consistency. Specifically, Cronbach's alpha values ranged from 0.80 to 0.92 for clinical samples and from 0.83 to 0.94 for nonclinical samples. The Cronbach's alpha values for EMS scales calculated on the study's patients ranged from 0.61 to 0.84, indicating an acceptable internal reliability (with the exception of 'emotional deprivation' and 'emotional inhibition' EMS scales with a Cronbach's alpha of 0.58 and 0.57, respectively, indicating a questionable internal reliability).

The *childhood experience of care and abuse questionnaire* (CECA-Q) [66, 67] is a self-administered questionnaire designed to retrospectively assess whether individuals experienced severe adversity during the first 17 years of life. The instrument is composed of two sections. The first section consists of two sets of 16 items that evaluate individuals' perceptions of aversion and neglect from both mothers and fathers. Both dimensions refer to the high-order variable 'lack of care' [66]. A score higher than 25 indicates a severe level of perceived aversion, whereas a score higher than 22 (for the mother) or 24 (for the father) indicates a severe level of perceived neglect [66]. The second part is composed of screening questions pertaining to physical and sexual abuse. The presence of physical and sexual abuse was evaluated with dichotomic responses (yes/no). By combining the results obtained from both sections, the following variables are generated: (1) abuse: the individual has experienced at least one kind of abuse (i.e., either sexual or physical abuse); (2) problematic parental bonding: the individual has experienced lack of care in terms of neglect or aversion from at least one parent, as indicated by scores

higher than the cut-off scores abovementioned. Original validation study showed a Cronbach's alpha of 0.80 for 'aversion' and 0.81 for 'neglect' scales [66]. The Italian version of the instrument demonstrated interrater reliability (Cohen's k) ranging from 0.66 to 1.00 and had high construct validity [67]. The Cronbach's alpha values calculated on the study's patients were 0.49 for the 'aversion' scale (mother), 0.62 for the 'aversion' scale (father), 0.51 for the 'neglect' scale (mother) and 0.76 for the 'neglect' scale (father).

Statistical analysis

Participants were categorized into two groups based on their burden of childhood trauma, according to the CECA-Q criteria outlined by Bifulco et al. [66] (see "Measures" section): the first group, referred to as 'High Trauma' (HT), comprised outpatients with severe childhood trauma (i.e., both abuse—either sexual or physical abuse—and problematic parental bonding). In contrast, the second group, named 'Low Trauma' (LT), consisted of outpatients with no/mild childhood trauma (i.e., either no abuse—neither sexual nor physical abuse—or no problematic parental bonding, or only one of these factors). To examine differences between the HT and LT groups in terms of sociodemographic and clinical continuous variables, a t test was utilized. A χ^2 test was conducted to assess the relationships between categorical variables. A bivariate correlation using Pearson's coefficient was computed to investigate the relationships between continuous variables. The tests were two-tailed, with a significance threshold set at 0.05. No adjustment for multiple testing was implemented due to the exploratory nature of the study. SPSS 27 was utilized to perform descriptive statistics and statistical tests.

A mediation analysis was conducted using the structural equation modeling procedure with bootstrapping sampling (5000 replications) in Stata 17. The dependent variable was the EDI-3-EDRC (i.e., the severity of ED symptoms, measured during the first admission to the Regional Centre for Eating Disorders), the independent variable was childhood trauma experienced before the age of 17, and each of the 18 YSQ EMSs (i.e., long-lasting maladaptive cognitive and emotional patterns that emerge following negative childhood events) was considered a mediator. The threshold for statistical significance in the mediation models was established at 0.05.

Results

Forty-two outpatients satisfied the abovementioned criteria (see "Study design and participants" section) for the registry data extraction (of 204 patients who

approached the centre between 2014 and 2016, 88 were asked to complete the questionnaires, of which 48% were included in the present analysis), providing data suitable for the present analysis. Within the sample analysed, the percentage of females was 95%. The mean age was 25.0 years ($SD=10.1$; sample's age ranged from 14 to 54 years old). Fifteen patients had a diagnosis of AN, 10 patients satisfied the criteria for a diagnosis of BN, and 17 patients were diagnosed with OSFED. The mean BMI was 20.05 kg/m^2 ($SD=4.18$), with a range from 16.00 to 33.00 kg/m^2 . Considering the severity of childhood traumatic experiences, 13 individuals (31%) exhibited severe childhood trauma and were classified as part of the HT group, while the remaining 29 participants were classified into the LT group. HT patients were older than LT patients (HT group's mean age=32.7 ($SD=11.4$) vs LT group's mean age=21.5 ($SD=7.3$)). The HT group had a significantly greater severity of ED symptoms, as shown by the Eating Disorder Risk Composite (EDRC) mean score ($p=0.017$). With respect to YSQ scores, the HT group had a general upwards trend in comparison to the LT group, with scores for emotional deprivation ($p=0.045$), defectiveness ($p=0.005$), failure ($p=0.020$), vulnerability ($p=0.049$), insufficient self-control ($p=0.026$), and negativity ($p=0.027$) attaining statistical significance. Tables 2 and 3 present sociodemographic and clinical data according to the burden of childhood trauma.

Mediation analyses

Mediation analyses were performed to explore whether EMS played a mediating role in the relationship between childhood trauma and symptoms of ED, as assessed during the first admission to the Regional Centre for Eating Disorders. Figure 1 represents the three mediation models.

A statistically significant relationship was found between severe childhood trauma and ED symptoms, as indicated by the estimated overall effect of severe childhood trauma on ED symptoms in terms of EDRC scores ($c=15.90$, $p=0.007$). When considering each EMS as a mediator, only schemas related to defectiveness, failure, and negativity exhibited a significant effect. Since there was no significant relationship between age and the following variables: EDRC score ($r=0.22$, $p=0.165$), defectiveness ($r=0.01$, $p=0.979$), failure ($r=0.04$, $p=0.809$), or negativity ($r=-0.02$, $p=0.891$), no adjustment for age was made. Severe childhood trauma had a significant positive effect on defectiveness (i.e., raised levels of scores) ($a=4.04$, 95% CI [1.32, 6.75], $p=0.004$). Additionally, defectiveness had a significant positive effect

Table 2 Sociodemographic data according to the burden of childhood trauma

| Sociodemographic variables | LT—low trauma <i>N</i> = 29 (% valid responses ¹) | HT—high trauma <i>N</i> = 13 (% valid responses ¹) | <i>p</i> value |
|----------------------------|---|--|----------------|
| Gender | | | |
| Female | 27 (93%) | 13 (100%) | 0.332 |
| Male | – | – | |
| Age mean (SD) | 21.5 (7.3) | 32.7 (11.4) | < 0.001** |
| Educational level | (1 missing data) | | |
| High | 13 (46%) | – | 0.204 |
| Low | 15 (54%) | – | |
| Marital status | | | |
| Single | 27 (93%) | – | |
| Married | – | – | 0.057 |
| Separated | – | – | |

SD = standard deviation; *p* value (significance associated with *t* test); ** $\alpha \leq .01$

To protect confidentiality cells with < 10 participants are not presented. ¹the percentages were calculated based on the number of patients with no missing data

on symptoms of eating disorders ($b = 1.49$, 95% CI [0.28, 2.70], $p = 0.016$). After adjusting for defectiveness, the direct effect of severe childhood trauma on symptoms of eating disorders was lower but not statistically significant compared to the overall effect ($c^1 = 9.88$; 95% CI [−2.09, 21.86], $p = 0.106$) (see Fig. 1a). Severe childhood trauma had a significant indirect effect on eating disorder symptoms through defectiveness, with a coefficient of 6.02 (95% CI [−0.17, 12.21], $p = 0.057$). The defectiveness accounted for 38% of the total effect.

The positive effect of severe childhood trauma on failure had a coefficient of 2.25 (95% CI [0.40, 4.11], $p = 0.017$), whereas the coefficient for the positive effect of failure on symptoms related to eating disorders was 2.59 (95% CI [0.86, 4.33], $p = 0.003$). After adjusting for failure, the direct effect of severe childhood trauma on ED symptoms decreased, but the difference was not statistically significant ($c^1 = 10.05$; 95% CI [−1.98, 22.09], $p = 0.101$) (see Fig. 1b). The indirect effect of severe childhood trauma on ED symptoms through failure was 5.85 (95% CI [−0.02, 11.72], $p = 0.051$), and the percentage of the total effect mediated by failure was 37%.

The coefficient for the positive effect of severe childhood trauma on negativity was 2.48 (95% CI [0.36, 4.60], $p = 0.022$), while that for the positive effect of negativity on symptoms of eating disorders was 1.83 (95% CI [0.33, 3.32], $p = 0.017$). Severe childhood trauma had a direct effect on symptoms of EDs, even after adjusting for negativity. The estimated coefficient for this direct effect was 11.38 (95% CI [−0.13, 22.89], $p = 0.053$) (see Fig. 1c). Additionally, an indirect effect of severe childhood trauma on eating disorder symptoms was found

through negativity. The estimated coefficient for this indirect effect was 4.52 (95% CI [−1.05, 10.10], $p = 0.112$). The percentage of the total effect that was mediated by negativity was 28%. The results of the mediation analyses for all 18 EMSs are shown in Table 4 (see Appendix).

Mediation analysis with multiple mediators

The inclusion of defectiveness, failure, and negativity as multiple mediators resulted in a decrease in the direct positive effect of severe childhood trauma on symptoms of eating disorders. However, this decrease was not statistically significant ($c^1 = 8.64$; 95% CI [−3.83, 21.11], $p = 0.174$). Through all three mediators, the indirect positive impact of severe childhood trauma on ED symptoms was 7.26 (95% CI [−0.47, 14.06], $p = 0.036$); through defectiveness, failure, and negativity, it was 1.94, 4.23, and 1.07, respectively.

Overall, 46% of the effect was mediated by all three mediators combined. When examining each mediator individually, the percentages of the overall effect that was mediated by defectiveness, failure, and negativity were 12%, 27%, and 7%, respectively. Figure 2 graphically represents a mediation model with multiple mediators, as shown below (Fig. 2).

Discussion

The main objective of the present work was to investigate the mediating role of EMSs in the association between childhood trauma and ED symptom severity. Literature has widely highlighted that EDs are influenced by a complex interaction between psychosocial and biological

Table 3 Clinical data according to the burden of childhood trauma

| Clinical variables | LT—low trauma N=29 | HT—high trauma N=13 | p value |
|---------------------------|-----------------------|------------------------|---------|
| ED diagnosis | | | |
| AN | 11 (38%) | – | 0.868 |
| BN | – | – | |
| OSFED | 11 (38%) | – | |
| BMI mean (SD) | 19.31 (3.11) | 21.70 (5.73) | 0.086 |
| YSQ mean (SD) | | | |
| Emotional deprivation | 1.3 (1.8) | 3.0 (3.4) | 0.045* |
| Abandonment | 5.1 (3.8) | 7.5 (4.4) | 0.073 |
| Abuse | 3.1 (2.9) | 3.8 (3.3) | 0.535 |
| Social isolation | 3.2 (2.7) | 4.8 (3.5) | 0.122 |
| Defectiveness | 3.3 (3.9) | 7.4 (4.3) | 0.005** |
| Failure | 2.2 (2.7) | 4.5 (3.0) | 0.020* |
| Dependence | 2.2 (2.9) | 4.3 (3.8) | 0.054 |
| Vulnerability | 1.5 (2.3) | 3.4 (3.5) | 0.049* |
| Enmeshment | 1.6 (1.9) | 0.8 (1.2) | 0.157 |
| Subjugation | 2.6 (3.4) | 3.8 (3.6) | 0.341 |
| Self-sacrifice | 6.2 (5.2) | 6.2 (5.6) | 0.974 |
| Emotional inhibition | 2.4 (2.1) | 3.4 (2.8) | 0.256 |
| Unrelenting standard | 4.6 (3.4) | 4.1 (2.8) | 0.680 |
| Entitlement | 1.4 (1.9) | 2.0 (2.5) | 0.406 |
| Insufficient self-control | 2.9 (3.1) | 5.5 (3.9) | 0.026* |
| Approval-seeking | 3.6 (4.0) | 4.2 (3.4) | 0.638 |
| Negativity | 3.1 (3.2) | 5.6 (3.3) | 0.027* |
| Punitiveness | 3.3 (3.3) | 4.9 (3.5) | 0.160 |
| EDI-3 | | | |
| EDRC mean score (SD) | 57.2 (20.2) | 73.1 (16.5) | 0.017* |

ED eating disorder; AN anorexia nervosa; BN bulimia nervosa; OSFED other specified feeding or eating disorders; BMI body mass index; YSQ Young schema questionnaire; EDI-3 eating disorder inventory-3; EDRC eating disorder risk composite; SD standard deviation; p value (significance associated with t test for continuous variable and with χ^2 for categorical variable); * $\alpha \leq 0.05$; ** $\alpha \leq 0.01$
 To protect confidentiality cells with < 10 participants are not presented

factors, within a trauma history may play its part [5]. Moreover, EMSs have been shown to play a mediating role in the association between psychopathology and trauma history [51, 52]. These results in the field of ED are still preliminary. The current research partially corroborated the findings of Meneguzzo et al. [53], who discovered a mediating effect of the disconnection/rejection domain. Our findings showed that the degree of defectiveness (i.e., belief about oneself as defective and

unlovable), failure (i.e., belief about oneself as incapable of achieving goals), and negativity (i.e., negative beliefs about life, minimizing positive aspects) mediated the relationship between childhood trauma and the severity of ED symptoms.

Furthermore, our results showed that patients with severe childhood trauma were older and reported greater severity of ED symptoms during the first admission to the Regional Centre, compared to patients with no/mild childhood trauma. This finding is in line with previous literature, which has already highlighted a positive association between a more severe clinical presentation of ED psychopathology and a history of multiple traumatic experiences [28, 58]. According to several authors [30, 42], in traumatized individuals, ED symptoms are considered a maladaptive coping mechanism for managing PTSD symptoms. Therefore, patients who experienced childhood abuse against the backdrop of dysfunctional parental bonding may be more engaged in ED behaviors such as dietary restriction, binge eating, and purging to manage adverse emotions and intrusive memories related to trauma. This could explain the greater severity of ED symptoms in these patients. Additionally, compared to ED patients with no/mild childhood trauma, ED patients with severe childhood trauma generally exhibited significantly greater EMS scores for emotional deprivation, defectiveness, failure, vulnerability, insufficient self-control, and negativity. According to Young’s [46] definition of EMSs—persistent cognitive and emotional patterns derived from early adverse life experiences—these findings supported the link between EMSs and trauma history [43, 46]. Emotional deprivation and defectiveness refer to the domain of disconnection/rejection, whereas vulnerability and failure refer to the domain of impaired autonomy/performance. These two domains were found to be prevalent in our data, which is consistent with the findings of a recent systematic review conducted by Lian et al. [48]. Insufficient self-control and negativity refer to the domains of impaired limits (i.e., difficulty in controlling impulses, engaging in goal-directed behaviour, and following rules) and over-vigilance/inhibition (i.e., tendency to suppress feelings, impulses, and choices), respectively. Although these two EMSs have been reported less frequently in trauma patients, our data suggest that they are associated with severe childhood trauma. This link may be explained by the fact that the whole study sample was characterized by an ED diagnosis. In fact, a range of personality profiles, such as the overcontrolled/inhibited and the undercontrolled/dysregulated subtypes, have been observed in the ED field [68]. Both undercontrolled/dysregulated

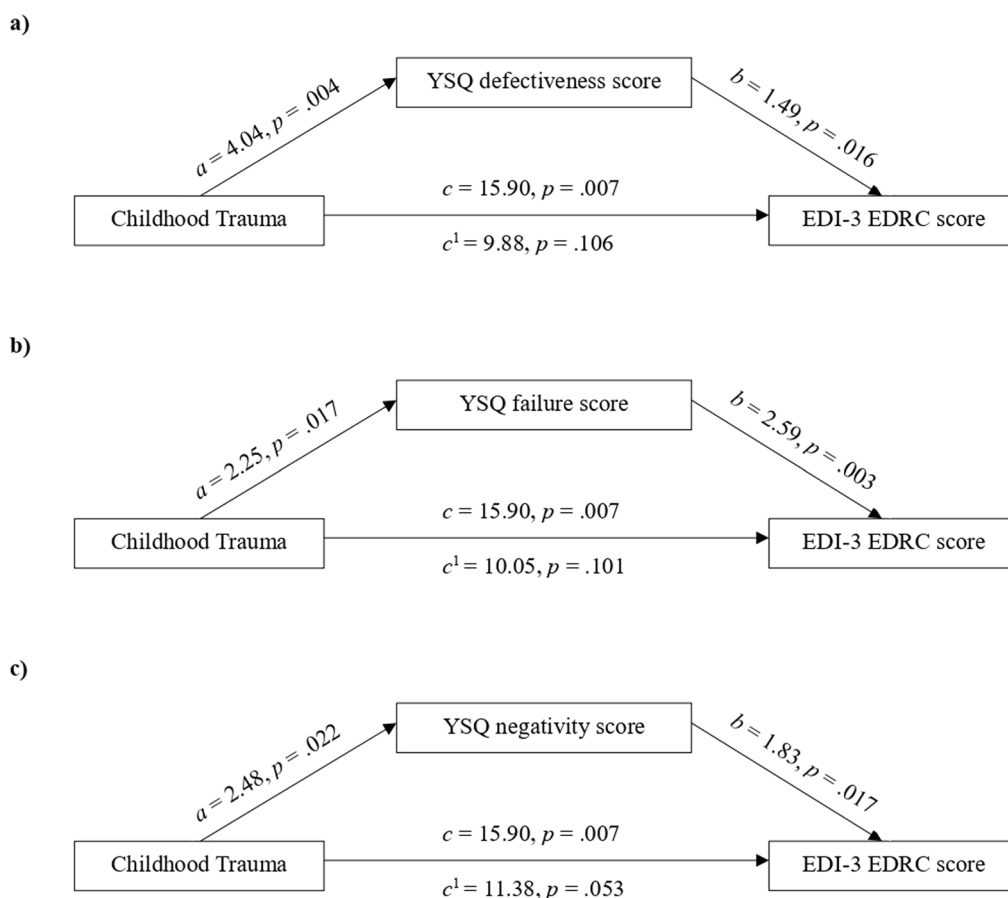


Fig. 1 Graphic representation of mediation analyses. Childhood Trauma measured as a categorical variable (High Trauma vs. Low Trauma) = independent variable; EDI-3 EDRC score = dependent variable; YSQ defectiveness score, YSQ failure score, and YSQ negativity score = mediators; YSQ = Young Schema Questionnaire; EDI-3 = Eating Disorder Inventory-3; EDRC = Eating Disorder Risk Composite; a = coefficient relating the independent variable to the mediator; b = coefficient relating the mediator to the dependent variable adjusted for the independent variable; c = coefficient relating the independent variable to the dependent variable; c' = coefficient relating the independent variable to the dependent variable adjusted for the mediator

and overcontrolled/inhibited personality subtypes were associated with emotion regulation problems, as shown by Donnellan and Robins [69]. We hypothesized that severe childhood trauma could maximize engagement in these dysfunctional personality patterns in ED patients. Particularly, the undercontrolled/dysregulated subtype is characterized by impulsivity, high sensitivity to rewards, and low effortful control and it has been more associated with BN and binge-eating symptoms. On the other hand, individuals with an overcontrolled/inhibited subtype, are characterized by high sensitivity to punishment, emotional vulnerability, rigidity, and inhibition of feelings [68–70] and they were more likely to exhibit restricting symptoms, such as restrictive AN and atypical AN [70]. EMSs develop when core emotional needs are not met during infancy; thus, from the attachment perspective

[37], experiencing early relationships with caregivers characterized by a lack of responsiveness, insensitivity, and insecurity impacts the way people face and regulate emotions [38]. Therefore, it has been shown that greater difficulties in emotion regulation were generally associated with all EMS domains, even though the magnitude of the correlations was greater for EMS ‘disconnection/rejection’, ‘impaired autonomy’, and ‘overvigilance/inhibition’ domains, and, specifically, for EMS ‘defectiveness/shame’ and ‘negativity’ [71].

According to Pugh [72], EMSs may influence several aspects of ED pathology, including risk behaviors, comorbidities, emotion dysregulation, and the severity of the ED. Furthermore, prior research has shown that ED behaviors, such as purging, dietary restriction, and over-exercise, play a role in the avoidance of negative emotions

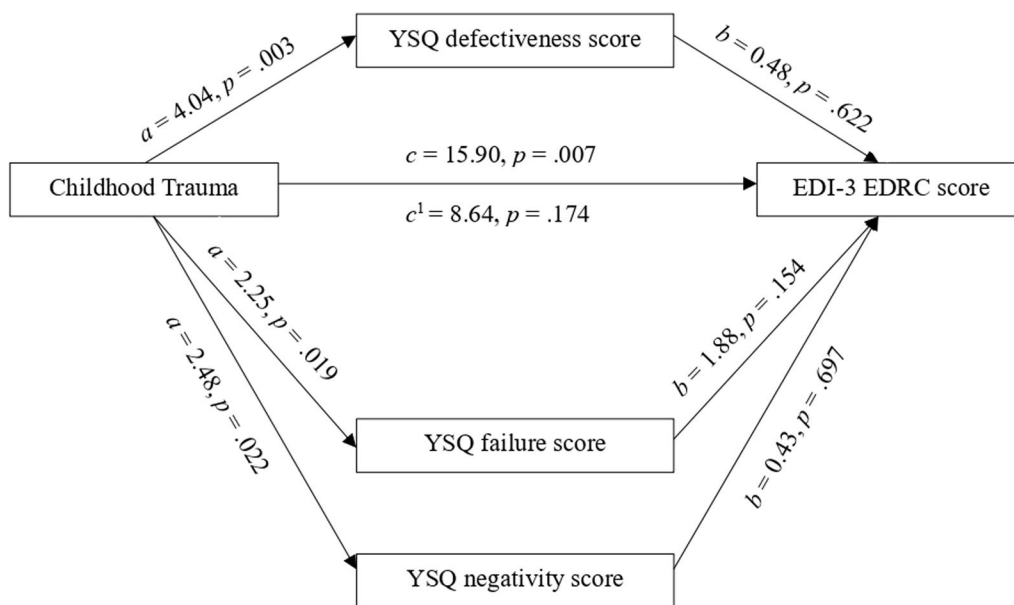


Fig. 2 Graphic representation of mediation analysis with defectiveness, failure and negativity as multiple mediators. Childhood Trauma measured as a categorical variable (High Trauma vs Low Trauma) = independent variable; EDI-3 EDRC score = dependent variable; YSQ defectiveness score, YSQ failure score, YSQ negativity score = mediators; YSQ = Young Schema Questionnaire; EDI-3 = Eating Disorder Inventory-3; EDRC = Eating Disorder Risk Composite; a = coefficient relating the independent variable to the mediator; b = coefficient relating the mediator to the dependent variable adjusted for the independent variable; c = coefficient relating the independent variable to the dependent variable; c^1 = coefficient relating the independent variable to the dependent variable adjusted for the three mediators combined

linked to schema activation [72, 73]. Within this framework, severe childhood trauma fosters the development of dysfunctional cognitive and emotional patterns—Early Maladaptive Schemas—that lead individuals to perceive life as negative and themselves as unlovable, defective, and failed. As a consequence, a greater severity of ED symptoms, which is indicative of greater cognitive and behavioural engagement in restrictive and/or binge-eating patterns, may represent a more dysfunctional attempt to avoid unpleasant emotions associated with this schema activation. Research on EDs has highlighted that ED individuals often experience stigmatization [74]. ED-related stigma is associated with feelings of shame, fear of criticism, and social isolation [75]. The difficulty in processing these negative emotions could trigger and reinforce the EMSs, particularly those of ‘disconnection/rejection’, ‘impaired limits’, and ‘impaired autonomy’ domains [76], suggesting a potential bidirectional relationship between EMSs and ED behaviors. Furthermore, past studies have shown that highly traumatized individuals were likely to exhibit self-stigma and lack of trust in healthcare systems, which may make it harder to seek treatment early [77, 78]. Similarly, greater negative self-images and cognitive beliefs about themselves as undeserving of care have been shown to represent a barrier to treatment seeking and utilization [79]. As a result, we speculate that the

higher age of patients with severe trauma—characterized by a greater representation of self as unlovable, defective, and incapable of achieving goals (i.e., greater EMSs ‘defectiveness’ and ‘failure’)—may be due to the lack of early access to healthcare services.

Our findings strengthened the need for ED psychotherapy treatments to focus on the EMSs, which are the primary target of Schema Therapy, an integrative therapy that combines traditional cognitive-behavioral techniques with elements from psychodynamic, gestalt, constructivism, and attachment models [72]. Despite its infancy, research on the application of Schema Therapy to EDs has shown promising results, including a reduction in ED symptoms and general psychopathology [80]. Schema therapy has been used both alone [81–83] and in conjunction with cognitive-behavioral therapy, particularly when traditional cognitive-behavioral techniques appear to have limited response [72, 84, 85]. Pugh [72] emphasized that traditional cognitive-behavioral treatment can be re-applied later, once obstacles are overcome with schema therapy procedures. Overall, it has been shown that Schema Therapy may be a valuable alternative for patients with high comorbidity and complexity and those who are unresponsive to first-line treatments (e.g., cognitive-behavioral therapy) [72, 86, 87].

A strength of this study concerns the systematic collection of data regarding all outpatients who were admitted to the Regional Centre for Eating Disorders. Moreover, internationally well-validated tools were used to assess clinical variables (i.e., ED symptomatology, trauma history, and EMSs). Nevertheless, the current study also has several limitations. First, the sample size was small, and the percentage of ED patients included in the study was low compared to the number of ED patients who approached the Regional Centre for Eating Disorders. This reduced the representativeness of the study sample; thus, our findings should be interpreted with caution. These aspects allow only an explorative approach to the data analysis, and it was not possible to conduct subgroup analyses. Moreover, no information about trauma in adulthood was collected; thus, it was not possible to account for these events. We exclusively collected data about childhood sexual and physical abuse without considering other types of childhood trauma exposure mentioned in the ED literature. Further studies should use measures that examine a broader range of childhood trauma (e.g., ACEs questionnaire). Moreover, we only considered the 'lack of care' dimension for evaluating parental bonding without including other related aspects such as overcontrol. Further studies should use tools that allow a more comprehensive assessment of parental bonding. Since the severity of trauma is subjective, another limitation of the study is the lack of evaluation of the perceived impact of trauma exposure, trauma-related symptoms, and other trauma-related factors (i.e., duration, the relationship with the abuser, and the individual meaning of the traumatic event), which could be a key aspect to explore in subsequent trauma research, given the different subjective reactions of individuals to trauma history. Moreover, the study did not include a healthy control group or another comparison clinical group since data were collected in a clinical centre specialized for ED treatment. Further studies should compare ED patients with healthy controls or other clinical samples, given that it could be relevant for better understanding the role of trauma in the expression of psychopathology. The unavailability of clinical data such as AN subtype, previous treatment experiences, and ED duration did not allow to investigate the role of clinical history on the trauma—ED symptoms severity relationship; thus, future research should consider these variables. In addition, due to the small sample size, we did not investigate whether the kind of ED diagnosis influences the relationship between childhood trauma burden and ED symptoms. This should

be a future research direction, because exploring whether ED diagnosis acts as an effect modifier is critical for understanding whether the relationship between childhood trauma burden and ED symptoms may be different according to ED diagnosis. Finally, all the data were collected through self-reported instruments, which may have introduced recall and social desirability bias. Hence, prospective longitudinal studies and multimethod assessments could be considered for further research in the field of ED and trauma.

Conclusion

The current study explores a relatively new field of research and provides preliminary evidence for the potential relevance of EMSs in the relationship between trauma history and ED psychopathology. Furthermore, the association between childhood trauma and ED severity reinforces the need to evaluate the trauma burden in ED patients and treat the trauma component. As a result, some authors have already begun to assess add-on trauma-focused therapy, such as eye movement desensitization and reprocessing (EMDR), to evidence-based treatments for ED (e.g., cognitive-behavioral therapy) [88–90]. In addition, our findings emphasize the importance of taking EMSs into account when treating ED patients who have a history of childhood trauma. EMSs represent a transdiagnostic concept that is relevant for the comprehension of dysfunctional and pervasive changes in cognitive and emotional processing that sustain the symptoms of mental disorders. To modify and reduce these EMSs, schema therapy was introduced. It has been shown that schema therapy is an effective treatment for conditions other than personality disorders [43]. Therefore, few recent studies have applied schema therapy for the treatment of ED symptomatology, and promising results have been reported [72, 80, 91].

Further research on the application of schema therapy in the ED field is needed to better understand the role of EMSs in ED pathology and to improve the treatment response in ED patients who do not receive any advantage from first-line treatments. Future longitudinal studies with larger sample sizes will be necessary to confirm these data.

Appendix

See Table 4.

Table 4 Results of the mediation analyses for all 18 EMSs

| YSQ EMS | Direct effect c^1 | p value | Mediated effect $c-c^1$ | p value | a | p value | b | p value |
|---------------------------|---------------------|-----------|-------------------------|-----------|------|-----------|------|-----------|
| Emotional deprivation | 12.93 | 0.028 | 2.97 | 0.210 | 1.69 | 0.094 | 1.76 | 0.179 |
| Abandonment | 13.57 | 0.029 | 2.33 | 0.260 | 2.47 | 0.079 | 0.94 | 0.233 |
| Mistrust/abuse | 14.69 | 0.014 | 1.22 | 0.555 | 0.63 | 0.543 | 1.93 | 0.062 |
| Social isolation | 13.19 | 0.021 | 2.72 | 0.179 | 1.56 | 0.152 | 1.74 | 0.072 |
| Defectiveness/shame | 9.88 | 0.106 | 6.02 | 0.057 | 4.04 | 0.004 | 1.49 | 0.016 |
| Failure | 10.05 | 0.101 | 5.85 | 0.051 | 2.25 | 0.017 | 2.59 | 0.003 |
| Dependence | 13.71 | 0.036 | 2.19 | 0.324 | 2.13 | 0.069 | 1.03 | 0.267 |
| Vulnerability | 14.25 | 0.020 | 1.66 | 0.428 | 1.87 | 0.076 | 0.89 | 0.476 |
| Enmeshment | 14.58 | 0.015 | 1.32 | 0.550 | 0.94 | 0.555 | 1.41 | 0.550 |
| Subjugation | 13.66 | 0.020 | 1.59 | 0.336 | 1.13 | 0.331 | 1.41 | 0.106 |
| Self-sacrifice | 15.85 | 0.007 | 0.05 | 0.974 | 0.06 | 0.974 | 0.87 | 0.132 |
| Emotional inhibition | 15.71 | 0.008 | 0.19 | 0.879 | 0.90 | 0.293 | 0.21 | 0.884 |
| Unrelenting standards | 15.88 | 0.002 | 0.02 | 0.666 | 0.01 | 0.986 | 2.38 | 0.005 |
| Entitlement | 15.89 | 0.009 | 0.01 | 0.930 | 0.06 | 0.956 | 0.18 | 0.928 |
| Insufficient self-control | 14.07 | 0.015 | 1.83 | 0.363 | 2.56 | 0.033 | 0.71 | 0.363 |
| Approval-seeking | 15.03 | 0.009 | 0.87 | 0.637 | 0.61 | 0.617 | 1.44 | 0.053 |
| Negativity | 11.38 | 0.053 | 4.52 | 0.112 | 2.48 | 0.022 | 1.83 | 0.017 |
| Punitiveness | 13.70 | 0.024 | 2.20 | 0.216 | 1.61 | 0.154 | 1.37 | 0.118 |

YSQ Young schema questionnaire; EMS early maladaptive schema; Childhood trauma burden as independent variable (IV), EDI-3-EDRC as dependent variable (DV), and each of the YSQ EMSs as mediator (MV). Total effect $c = 15.90$, $p = 0.007$; a : effect of IV on MV; b : effect of MV on DV

Abbreviations

| | |
|----------|---|
| EDs | Eating disorders |
| EMSs | Early maladaptive schemas |
| DSM-5-TR | Diagnostic and statistical manual of mental disorders, fifth edition, text revision |
| AN | Anorexia nervosa |
| BN | Bulimia nervosa |
| OSFED | Other specified feeding or eating disorders |
| UFED | Unspecified feeding or eating disorders |
| BED | Binge eating disorder |
| ARFID | Avoidant/restrictive food intake disorder |
| PTSD | Posttraumatic stress disorder |
| CPTSD | Complex posttraumatic stress disorder |
| EDI-3 | Eating disorder inventory-3 |
| YSQ | Young schema questionnaire |
| EDRC | Eating disorder risk composite |
| CECA-Q | Childhood experience of care and abuse questionnaire |
| HT | High trauma |
| LT | Low trauma |
| BMI | Body mass index |
| EMDR | Eye movement desensitization and reprocessing |

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Author contributions

RBD, MDF, MR and C Bonetto conceptualized the study. MB, FB, MC, SC, and BS supervised the data collection. DC contributed to the data extraction. C Bonetto analysed the data. RF drafted the manuscript. RF, C Bonetto and C Barbu contributed to the revision and editing of the final manuscript. All authors critically reviewed and approved the final draft of the manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study involving human participants was conducted in accordance with the ethical standards of the institutional and national research committee, as well as the Declaration of Helsinki (1964) and its later amendments, or equivalent ethical standards. The data were extracted from the Regional Centre for Eating Disorders (ED) registry (University Hospital of Verona), which was approved by the Verona University Hospital Ethics Committee (CESC Protocol number 48455 of 8 August 2022). All participants provided their written consent to have their data recorded in the Regional Centre for Eating Disorders (ED) registry.

Consent for publication

Not Applicable.

Competing interests

The authors declare that they have no competing interests.

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