

ORIGINAL RESEARCH ARTICLE

Involvement of adverse life events in body image distortion in a patient with eating disorders

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Adverse life events (ALEs), particularly interpersonal ALEs and those experienced during childhood are associated with adult psychopathology. Altered eating behaviors and body image distortion (BID) have been reported in maltreated children. This study aimed to evaluate the presence of interpersonal ALEs before the age of 13 years in patients with eating disorders (ED) and clarify its relationship with BID. This observational case-control study comprised the ED group, including 79 outpatients with ED, and two control groups, including 20 outpatients with depressive disorder and 41 participants with no history of mental illness. The presence of ALEs was determined using the Traumatic Events Questionnaire. To assess BID, the contouring drawing rate scale was used, and visual BID was distinguished from non-visual BID. Data were collected and processed using Statistical Package for Social Sciences v28. All tests were two-tailed (significance level of 0.05). Patients with ED had a higher proportion of interpersonal ALEs during childhood ($P = 0.065$). In the ED group, patients with interpersonal ALEs during childhood overestimated their shape ($P = 0.021$). The non-visual BID was significantly higher in patients with childhood ALEs. In a logistic regression model, the presence of interpersonal ALEs during childhood as an independent variable predicted visual and non-visual BID in patients with ED. During the estimation of body shape, it appears that the negative emotions experienced during childhood are shifted to the body shape itself. Thus, the BID experienced is attributed more to the unresolved emotions of the maltreated individuals than to the social pressures experienced.

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1. Introduction

Eating disorders (EDs) are serious medical conditions that are often comorbid with psychiatric disorders.¹ Poor illness outcomes are associated with body image distortion (BID) and dissatisfaction with one's shape.² Patients with ED who have experienced emotional and physical abuse are more likely to have concerns about body shape and weight.³

Trauma exposure is considered a non-specific risk factor for ED, and several adverse life events (ALEs), mostly occurring within a trusting relationship, have been implicated in the onset and maintenance of the illness.⁴⁻⁷ However, it remains unclear whether the onset of psychopathology is due to maltreatment or other factors such as the timing or frequency of traumatic experiences.⁸

Various forms of ALEs, including physical abuse, physical neglect, emotional abuse, emotional neglect, and sexual abuse, have been identified as child maltreatment.⁹ Interpersonal trauma has been classified as maltreatment and associated with post-traumatic symptoms.¹⁰ ALEs have also been linked to the development of body image, along with personal, social, and interpersonal factors.¹¹ In addition, childhood experiences of pain and hunger, exploration of the environment, and relationships with parents have been found to contribute to the development of altered body image.¹² The body image construct includes attitudes, perceptions, emotions, and thoughts.^{11,13} A growing body of research indicates that body representation relies on multisensory perceptions toward which therapeutic efforts can be directed.¹⁴

A recent systematic review of the effects of maltreatment on patients with ED reported alterations in the parietal cortex and thalamic areas involved in the visual perception of shape.^{15,16} The early years of development are critical for neurobiological maturation and enhancement of relationship skills.¹⁷ Adverse childhood experiences before the age of 6 years can interfere with the development of secure attachment and good emotion regulation.¹⁴ Exposure to physical or sexual abuse in early childhood has been associated with depression, post-traumatic symptoms, and anxiety in adulthood.¹⁷ Patients with ED who have experienced humiliation from peers or intrafamilial abuse show greater body dissatisfaction, with shame as a mediating factor between ALEs and body image.¹⁵ In addition, ALEs have been associated with alterations in the glucocorticoid or noradrenergic system.¹⁵

Perfectionism has been identified as a predictor of ED development.¹⁸ Quilliot *et al.* revealed that bullying, sexual abuse, and dissociative symptoms are associated with emotional dysregulation in patients with ED.¹⁹ Armour *et al.* reported that impulsivity was associated with self-injurious behaviors and body rumination in patients with ED and those with affective disorders who had experienced interpersonal ALEs.²⁰ Emotional dysregulation may be related to body dissatisfaction through perfectionism, according to Donahue *et al.*¹⁸

To date, no study has evaluated the relationship between ALEs and BID in patients with ED. Some studies have examined different subtypes of ALEs and their association

with bulimic symptoms or body mass index (BMI).^{3,5} We hypothesized that patients with ED who experienced interpersonal ALEs before the age of 13 years (pre-13 interpersonal ALEs) are more likely to present with BID. This study aimed to examine the relationship between pre-13 interpersonal ALEs and both visual and non-visual BID in patients with ED. In addition, this study examined the relationship between pre-13 interpersonal ALEs and the development of perfectionism and impulsivity.

2. Methods

2.1. Study design and participants

We conducted an observational, cross-sectional, case-control study. Eligible participants ($n = 187$) underwent an assessment to determine whether they met the inclusion and exclusion criteria. This study involved three comparison groups: A study group (ED group) of patients with ED and two control groups consisting of patients with recurrent major depressive disorder (RMDD) and participants with no history of mental illness. The control groups were selected from non-clinical populations with mood disorders who showed BID.^{11,21} In addition, affective disorders are known to be associated with ED.² Psychiatrists and psychologists of the relevant treatment units performed the initial selection of outpatients. Based on the inclusion criteria, 107 eligible patients with ED and 35 with RMDD were consecutively recruited by their therapists when they attended their follow-up. For the recruitment of the control group with no history of mental illness, we distributed information leaflets describing the study and containing contact information on the hospital bulletin boards, and 45 eligible candidates were selected.

The inclusion criteria were as follows: Age 18 – 65 years; diagnosis of restricting and purging anorexia nervosa, bulimia nervosa, or binge ED and RMDD according to the diagnostic and statistical manual of mental disorders, 5th Edition²²; good command of the Spanish language; and provision of written informed consent. The exclusion criteria were as follows: BMI of $<15 \text{ kg/m}^2$, high suicide risk, presence of psychotic symptoms, or intellectual disability.

Finally, the study included 140 participants, including 79 (56.4%) patients with ED, 20 (14.3%) patients with RMDD, and 41 (29.3%) controls. The mean age of the participants (total sample) was 38.5 (range: 18 – 60, standard deviation [SD]: 12.3) years; 90% of the participants were females, 68.6% completed college education, and 70% were employed. ALEs were reported by 89.3% of the participants.

2.2. Measurement and procedure

Recruitment was conducted between January 2021 and May 2022. Participants attended a face-to-face interview at

the hospital, where they signed an informed consent form and completed a questionnaire, providing information on age, sex, diagnosis of ED or RMDD, duration of illness, years of treatment, and number of hospitalizations. The interviewer recorded the height and weight of the participants to obtain BMI. The following tests were used to assess the clinical features, ALEs, and body image:

1. Traumatic life events questionnaire.²³ This is a 23-item self-report questionnaire designed to assess ALEs with dichotomous responses (YES/NO). Participants select their most distressing traumatic experiences and report the age at which they occurred and the level of distress associated with them. This allows for the examination of common ALEs, both interpersonal and non-interpersonal, over the course of an individual's lifetime. The questionnaire has been tested on diverse populations and has satisfactory psychometric properties (internal consistency of 0.74 – 0.91).
2. Contour Drawing Rating Scale (CDRS). This scale was developed and validated by Thompson and Gray in 1995.²⁴ It consists of nine male and nine female drawings that are rated from 1 to 9 based on their size. Participants select the drawing that represents their ideal body and the one that they believed was closest to their actual weight. This scale is useful in assessing body dissatisfaction and BID and has good internal consistency (Cronbach's alpha coefficient: 0.92).
3. Eating disorder inventory (EDI-2): This is also a self-report measure of ED.²⁵ This questionnaire comprises 91 items and uses a 6-point Likert scale (1 = never; 6 = always). It explores a range of clinical features and is classified into 11 subscales: Drive for Thinness, Bulimia, Body Dissatisfaction, Inefficacy, Perfectionism, Interpersonal Distrust, Interoceptive Awareness, Maturity Anxiety, Ascetism, Impulse Regulation, and Social Insecurity. It can discriminate patients with illness from those who are not clinically ill. Its internal consistency score ranges from 0.83 to 0.93.

The primary outcome of the study was the presence of ALEs. In accordance with a previous study,¹⁰ we classified the recorded ALEs into two categories: (1) interpersonal ALEs and (2) non-interpersonal ALEs. In addition, an analysis that considered the presence of pre-13 ALEs (both interpersonal and non-interpersonal) and the presence of pre-13 interpersonal ALEs was conducted.

The secondary outcomes assessed included levels of perfectionism, impulsivity, and the presence of BID. To examine the presence of BID, the CDRS was used to determine the participants' ideal body image, visual BID, non-visual BID, and actual shape according to their BMI. The body that patients "see" was "separated" from the

body that they "feel." First, the participants selected the silhouette they believed represented their body when they looked at themselves in the mirror (visual BID); second, they were instructed to close their eyes and try to feel their body before choosing the body shape (non-visual BID). The difference between the figure they chose and the actual shape according to BMI defined the BID. We defined three categories: (1) overestimation of the body shape, (2) underestimation of the body shape, and (3) absence of BID when the figure they chose was superior, inferior, or equal to the actual BMI, respectively.

2.3. Statistical analysis

All statistical analyses were performed using Statistical Package for the Social Sciences 24.0 (IBM Software, Illinois).²⁶ To examine differences within the ED group, Student's t-test was used to compare the presence of interpersonal ALEs and pre-13 interpersonal ALEs (a dichotomized categorical variable) with the quantitative variables when the sample size was >30. When the sample size was <30, the Mann-Whitney *U* test was used. To examine intergroup differences (ED, RMDD, and control groups) in the quantitative measures of BID, impulsivity, and perfectionism in relation to interpersonal ALEs, pre-13 ALEs, and pre-13 interpersonal ALEs, the one-factor parametric analysis of variance test and Kruskal-Wallis test were used. Similarly, a linear regression model was established to assess the impact of pre-13 interpersonal ALEs on BID, perfectionism, and impulsivity. All statistical tests were performed using a two-tailed approach, with the significance level set at an alpha value of 0.05.

3. Results

3.1. General sample description

As shown in Table 1, 72 patients with ED (91.1%) reported having experienced ALEs in their lifetime, with 69.6% reporting non-visual BID and 65% reporting visual BID. The mean duration of illness was 17.1 (range: 1 – 47; SD: 2.9) years, and 44.3% of patients reported at least one hospitalization (mean: 0.81, range: 0 – 5, SD: 1.1). Furthermore, 100% and 80.5% of participants in the RMDD and control groups reported the presence of ALEs, respectively, and no differences were noted between non-visual and visual BID in 60% of patients in the RMDD group and 61% of patients in the control group. Family and social relationships were considered better in the control group.

3.2. Characteristics of ALEs in the sample

As shown in Figure 1, patients in the ED group (black column) had a higher proportion of interpersonal ALEs

Table 1. Descriptive statistics of the groups

	ED (<i>n</i> =79)	RMDD (<i>n</i> =20)	CG (<i>n</i> =41)	TS (<i>n</i> =140)
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Sex				
Male	3 (3.8)	6 (30.0)	4 (9.8)	13 (9.3)
Female	76 (96.2)	14 (70.0)	37 (90.2)	127 (90.7)
Marital status				
Single	19 (24.1)	2 (10.0)	16 (39.0)	37 (26.4)
Separated	14 (17.7)	4 (20.0)	4 (9.8)	22 (15.7)
Married and/or cohabiting	45 (56.9)	13 (65.0)	20 (48.8)	78 (55.8)
Widowed	1 (1.3)	1 (5.0)	1 (2.4)	3 (2.1)
Education				
Primary	4 (5.1)	0 (0.0)	2 (4.9)	6 (4.2)
Secondary	5 (6.3)	1 (5.0)	1 (2.4)	7 (5.0)
Professional training	16 (20.3)	9 (45.0)	6 (14.6)	31 (22.1)
University degree	54 (68.4)	10 (50.0)	32 (78.0)	96 (68.5)
Employment status				
Active/student	52 (65.8)	8 (40.0)	38 (92.5)	98 (70.0)
Unemployed with benefit	5 (6.3)	5 (25.0)	1 (2.5)	11 (7.8)
Unemployed without benefit	4 (5.1)	4 (20.0)	0 (0.0)	8 (5.7)
Temporary incapacity for work	7 (8.9)	3 (15.0)	0 (0.0)	10 (7.1)
Permanent incapacity for work	4 (5.1)	0 (0.0)	0 (0.0)	4 (2.8)
Retired	7 (8.9)	0 (0.0)	2 (5.0)	9 (6.4)
Family relationships				
Good	49 (62.0)	13 (65.0)	37 (90.2)	99 (70.7)
Bad	4 (5.1)	1 (5.0)	0 (0.0)	5 (3.5)
Fair	26 (32.9)	3 (15.0)	4 (9.8)	33 (23.5)
Absent	0 (0.0)	3 (15.0)	0 (0.0)	3 (2.1)
Social relationships				
Good	53 (67.1)	13 (65.0)	37 (90.2)	103 (73.5)
Bad	3 (3.8)	3 (15.0)	0 (0.0)	6 (4.2)
Fair	14 (17.7)	4 (20.0)	4 (9.8)	22 (15.7)
Absent	9 (11.4)	0 (10.0)	0 (0.0)	9 (6.4)
BMI at assessment				
Underweight	11 (13.9)	2 (10.0)	3 (7.3)	16 (11.4)
Normal weight	33 (41.7)	13 (65.0)	24 (58.5)	70 (50.0)
Overweight	35 (44.3)	5 (25.0)	14 (34.1)	54 (38.5)
Presence of ALE				
No	7 (8.9)	0 (0.0)	8 (19.5)	15 (10.7)
Yes	72 (91.1)	20 (100.0)	33 (80.5)	125 (89.3)
Visual BID				
No	28 (35.0)	8 (40.0)	16 (39.0)	52 (37.1)
Yes	51 (65.0)	12 (60.0)	25 (61.0)	88 (62.9)
Non-visual BID				
No	24 (30.4)	8 (40.0)	16 (39.0)	48 (34.3)
Yes	55 (69.6)	12 (60.0)	25 (61.0)	92 (65.7)

Abbreviations: ALEs: Adverse life events; BID: Body image distortion; CG: Control group; ED: Eating disorders; NA: Not applicable; RMDD: Recurrent major depressive disorder; TS: Total sample.

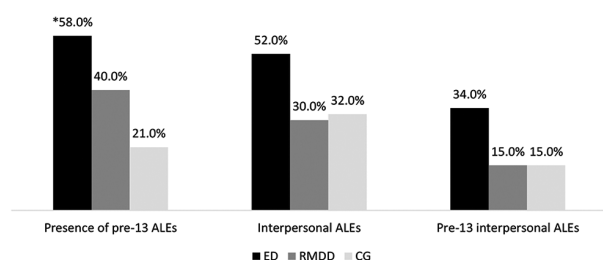


Figure 1. Intergroup differences with regard to ALE categories. *Chi-square test, with $P < 0.05$.

Abbreviations: ALEs: Adverse life events; CG: Control group; ED: Eating disorders; RMDD: Recurrent major depressive disorder.

($P = 0.062$) and pre-13 interpersonal ALEs ($P = 0.065$) than those in the other two groups. When considering pre-13 ALEs, whether interpersonal or non-interpersonal, the ED group reported a significantly higher number of childhood ALEs than the other two groups ($P = 0.042$).

The control group exhibited significantly lower levels of extreme distress than the other two groups ($P = 0.036$). Furthermore, the age of reporting the most distressing ALE was lower in the ED group than in the other two groups ($P = 0.051$).

3.3. Characteristics of BID in the sample

Figures 2 and 3 depict the BID of patients with ALEs. Patients in the ED group overestimated their shape. However, they evaluated their figures more accurately when looking in the mirror. Although not significant, a larger proportion of patients displayed non-visual BID (69.6%) compared with visual BID (64.5%). Patients in the RMDD group reported a non-visual overestimation of their figure that was not present when they looked in the mirror. The ED group showed significantly higher visual BID ($P = 0.034$) than the other two groups.

The analysis of intragroup differences regarding the type of BID revealed that non-visual overestimation of the shape was prevalent in the ED group with more body dissatisfaction ($P = 0.034$). Conversely, in the control group, body dissatisfaction was associated with visual BID ($P = 0.020$). The RMDD group did not report any differences.

3.3.1. Relationship between ALEs, impulsivity, perfectionism, and BID among the groups

Table 2 illustrates the discrepancies in the levels of perfectionism, impulsivity, and BID with regard to ALE categories.

Regarding interpersonal ALEs, the ED group displayed more pronounced levels of perfectionism, whereas the RMDD group exhibited reduced levels of impulsivity

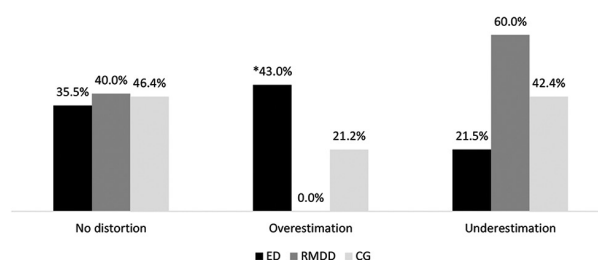


Figure 2. Visual BID. Patients in the ED group (black columns) showed the highest visual overestimation, whereas those in the RMDD group and CG (dark and clear gray columns, respectively) underestimated their shape when looking in the mirror. *Kruskal–Wallis test, with $P < 0.05$.

Abbreviations: ED: Eating disorders; RMDD: Recurrent major depressive disorder; CG: Control group.

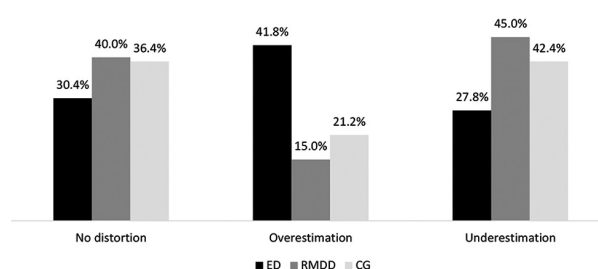


Figure 3. Non-visual BID. In this histogram, patients in the ED group overestimated their shape whereas the other groups mostly underestimated their shape

Abbreviations: ED: Eating disorders; RMDD: Recurrent major depressive disorder; CG: Control group.

compared with the other two groups. Regarding pre-13 ALEs (interpersonal or non-interpersonal), the ED group displayed higher levels of impulsivity and perfectionism, although the difference was not significant. Similarly, patients in the ED group who experienced both interpersonal and pre-13-year ALEs exhibited higher levels of impulsivity and perfectionism than those in the other two groups, although this effect was not statistically significant.

Regarding BID, patients in the ED group who experienced interpersonal ALEs overestimated their body shape both visually and non-visually. However, only the visual BID differed significantly between the ED group and the other two groups. Patients in the other two groups underestimated their body shape. Furthermore, the ED group demonstrated a markedly higher prevalence of body dissatisfaction. When considering pre-13 ALEs (interpersonal or non-interpersonal), the ED group demonstrated higher levels of visual and non-visual BID and body dissatisfaction than the other two groups. When considering pre-13 interpersonal ALEs, the ED group displayed heightened levels of body dissatisfaction and visual BID. Nevertheless, the non-visual overestimation

Table 2. Differences in perfectionism, impulsivity, and BID with respect to ALE categories

	ED Mean (SD)	RMDD Mean (SD)	CG Mean (SD)	P*
Interpersonal ALEs				
EDI-P	7.90 (4.02)	5.33 (4.92)	4.30 (4.31)	0.028
EDI-I	5.61 (6.00)	1.33 (1.21)	2.53 (5.57)	0.034
Visual BID	0.80 (1.80)	−0.83 (1.21)	−0.70 (0.95)	0.038
Non-visual BID	0.70 (2.11)	−0.75 (1.22)	0.00 (1.35)	0.158
CDRS BD	3.29 (2.12)	1.41 (1.02)	0.69 (0.75)	0.002
EDI-BD	18.90 (10.81)	6 (6.35)	4.69 (4.92)	0.002
BMI	21.58 (6.79)	22.6 (4.19)	23.82 (4.52)	0.385
ALEs (both interpersonal and non-interpersonal) before the age of 13 years				
EDI-P	7.4 (4.11)	7 (4.32)	3.16 (3.33)	0.489
EDI-I	5.05 (5.94)	2.62 (3.02)	2.33 (5.71)	0.082
Visual BID	0.82 (1.60)	−0.75 (1.06)	−0.5 (0.83)	0.004
Non-visual BID	0.85 (1.85)	−0.68 (1.48)	−0.66 (0.51)	0.015
CDRS BD	3.20 (2.19)	1.62 (2.08)	0.66 (0.81)	0.013
EDI-BD	17.85 (10.95)	10.87 (10.42)	6.66 (5.24)	0.033
BMI	25.24 (8.91)	29.08 (9.03)	22.7 (1.33)	0.546
Interpersonal ALEs before the age of 13 years				
EDI-P	8.34 (3.94)	6 (4.66)	3.00 (4.24)	0.082
EDI-I	6.15 (6.37)	1.20 (1.30)	3.50 (7.00)	0.218
Visual BID	1.01 (1.83)	−1.00 (1.27)	−0.5 (1.00)	0.021
Non-visual BID	0.98 (2.09)	−0.90 (1.88)	−0.75 (0.50)	0.070
CDS BD	3.55 (2.20)	1.55 (1.11)	1.00 (0.81)	0.022
EDI-BD	19.65 (10.48)	7.20 (6.30)	7.00 (5.88)	0.016
BMI	25.59 (10.36)	28.34 (7.23)	22.85 (1.70)	0.513

Note: We represent the significant differences in bold. *Kruskal–Wallis test, with $P < 0.05$.

Abbreviations: ALEs: Adverse life events; BD: Body dissatisfaction; BID: Body image distortion; BMI: body mass index; CDRS: Contour Drawing Rating Scale; CG: Control group; ED: Eating disorders; EDI-BD: Eating disorder inventory, subscale body dissatisfaction; EDI-I: Eating disorder inventory, subscale impulse regulation; EDI-P: Eating disorder inventory, subscale perfectionism; RMDD: Recurrent major depressive disorder; SD: Standard deviation.

in the ED group was not significantly different compared with that in the RMDD and control groups.

3.3.2. Relationship between ALEs, impulsivity, perfectionism, and BID in the ED group

At the intragroup level, patients in the ED group who reported interpersonal ALEs exhibited heightened levels of perfectionism ($P = 0.041$) and impulsivity ($P = 0.056$). Conversely, patients in the RMDD group who had interpersonal ALEs showed reduced impulsivity ($P = 0.002$).

Patients in the ED group who showed pre-13 ALEs ($P = 0.038$) demonstrated a heightened propensity for non-visual BID. No significant differences were observed in the RMDD or control group with regard to this ALE category.

With regard to the category of pre-13 interpersonal ALEs, the analysis yielded significant differences in the levels of perfectionism, which were higher ($P = 0.017$) among patients in the ED group who had experienced such an event than among those who had not. Obsessive thoughts about weight loss and impulsivity exhibited tendencies that approached statistical significance (EDI-Drive for thinness, $P = 0.052$; EDI-Impulsivity, $P = 0.055$).

A linear regression analysis was conducted to investigate the relationship between pre-13 interpersonal ALEs and BID. To gain further insight into the potential predictors of pre-13 ALEs, several alternative models were examined. The initial model was constructed using BMI. The second model incorporated pre-13 interpersonal ALEs. The third model included pre-13 interpersonal ALEs, along with BMI and the number of hospitalizations. The results indicated that experiencing interpersonal ALEs before the age of 13 years is predictive of a visual BID in adulthood. Moreover, this model was effective in predicting non-visual BID. The influence of pre-13 interpersonal ALEs on other variables was examined, and this traumatic factor was found to be a predictor of impulsivity ($P = 0.001$) and perfectionism ($P = 0.021$).

4. Discussion

This study assessed the presence of interpersonal ALEs in patients with ED and elucidated the relationships of pre-13 interpersonal ALEs with BID, impulsivity, and perfectionism. As hypothesized, the results indicated that patients in the ED group who reported pre-13 interpersonal ALEs had significantly higher levels of BID than those in the other two groups. Patients in the ED group overestimated their body shape, both visually and non-visually. However, the difference in overestimation between the groups was significant only for visual BID.

Studies have reported a relationship between BID in patients with ED and changes in brain function in the parietal cortex while undergoing visual self-assessment.^{15,27} Chemsquy and Helguera suggested that individuals with high perfectionism are particularly vulnerable to stressful relationships.²⁸ Children who experience interpersonal ALEs may develop strategies to cope with negative emotions, including exerting control over their bodies. This may affect the accuracy of self-evaluation when looking in the mirror because of the influence of their perfectionist tendencies. This could explain why patients with ED and interpersonal ALEs tend to report negative self-evaluations

in the form of overestimation when looking at themselves in the mirror. In addition, if they have a family dynamic based on physical appearance, they may judge themselves with the notion of the body image that their parents helped to create.^{11,14} Moreover, patients in the ED group who had interpersonal ALEs showed a higher level of perfectionism than those in the other two groups. Conversely, the RMDD and control groups underestimated their body shape in and out of the mirror, indicating a tendency to adapt their body shape to social requirements.¹¹ Patients in both groups had higher BMIs than those in the ED group.

Patients in the ED group, who reported pre-13 ALEs, regardless of type, had significantly higher visual and non-visual BID than those in the other two groups. Body identity is formed through sensory experiences in the early months of life and develops during the 1st few years of life when the mother/parent–child relationship is paramount.^{12,14,29} ALEs have been implicated in the development of body image.^{12,16,30} Individuals with secure attachments and trusting relationships are generally more satisfied with their bodies.^{12,14,30} Therefore, it is hypothesized that the presence of interpersonal ALEs during early adolescence affects body image. Negative emotions related to previous interpersonal ALEs may influence body perception when patients close their eyes.

To test this hypothesis, the body that patients visually perceived was distinguished from the body that they accurately perceived after closing their eyes and physically feeling their body shape before selecting the figure that corresponded to their true appearance. Patients with ED overestimated their body shape, both visually and non-visually, whereas participants in other groups tended to underestimate their body shape.

The RMDD group overestimated their body shape when they felt their body, but not when they looked at themselves in the mirror. This non-visual overestimation occurs in patients who are overweight, and they underestimate their body shape in the mirror. In general, underestimation is associated with a high BMI.¹¹ When patients with depression look at themselves in the mirror, they judge themselves with the social requirement of a thin body. In line with this finding, a recent study reported body distortion associated with weight bias in patients with depression with the negative effects influencing perception.³¹ Thus, the visual BID of patients with depression might be based on this weight bias, whereas the non-visual BID might respond to negative emotions derived from ALEs.¹⁵

Interestingly, the non-visual bias is intensified when non-visual senses are engaged, such as interoceptive, proprioceptive, and emotional experiences, which become apparent after closing the eyes. This indicates that

interpersonal ALEs affect the activation of regions involved in body awareness.¹⁶ These regions have been linked to emotional regulation and show changes in adults who suffered childhood abuse.¹⁶ Thus, promoting a connection to the inner emotional world by encouraging patients to feel their bodies may lead to altered body evaluation in individuals with interpersonal ALEs.¹⁴ This supports the notion that body evaluation is not only socially influenced, as individuals with ALEs may also experience an alteration in their ability to mentalize, which is associated with emotional dysregulation.¹⁴ This concept is supported by the finding that in the ED group, body dissatisfaction was significantly related to non-visual BID, whereas in the control group, body dissatisfaction was related to visual BID. Furthermore, social bias may influence visual perception, and emotional bias may create a negative embodiment that generates non-visual BID.^{14,31–33}

Consistent with this idea, several studies have indicated the prevalence of somatoform symptoms, emotion dysregulation, insecure attachment, and anxiety in adults who experienced interpersonal ALEs in childhood.^{34,35} The ED population with interpersonal ALEs has been described as having insecure attachment in addition to body dissatisfaction and emotion dysregulation.^{14,30} This may lead to challenges in identifying bodily sensations and distinguishing them from emotional states, as reported previously in patients with ED.^{32,33} Our findings are consistent with this idea, as we found higher non-visual BID in patients with pre-13 ALEs. ALEs may lead to insecure attachment, which in turn is related to an unacknowledged emotional state affecting the body.^{14,32} The lack of positive family experiences or emotions such as shame after bullying has been associated with a negative body image.³³ Family functioning based on control may influence how people experience their bodies.³² The ED group reported less support from their parents or peers. Thus, we cannot exclude the possibility that BID is influenced by an insecure attachment derived from patients' family experiences.

At the intragroup level, pre-13 interpersonal ALEs identified patients with ED who show higher levels of perfectionism and significantly different levels of impulsivity. At the intergroup level, the ED group with interpersonal ALEs (regardless of age) had higher levels of perfectionism than the other two groups. Patients with depression and those without mental illness did not show significant differences with regard to body image and ALE category. Only patients with RMDD and interpersonal ALEs had lower levels of impulsivity ($P = 0.002$). This difference could be explained by the sample size, with the RMDD group reporting a lower proportion of interpersonal ALEs.

Finally, linear regression analysis revealed that pre-13 interpersonal ALEs predicted both visual and non-visual BID. The model was also suitable for predicting the levels of perfectionism and impulsivity in the ED group. BID is considered an independent factor for predicting low body weight in patients with anorexia nervosa or fasting in patients with bulimia nervosa.³⁶ This study suggests that BID is dependent on interpersonal ALEs during middle childhood. In general, interpersonal ALEs have been associated with the cognitive aspects of body image in patients with ED.^{3,7,33} Possible mediators include post-traumatic stress disorder and binge eating.^{5,15} Impulsivity and perfectionism are fundamental psychopathological dimensions of individuals with ED that can be used as prognostic factors for assessing disease progression.^{36,37} The experience of interpersonal trauma during childhood may lead to starvation and body control as a means to manage negative emotions, likely due to unrecognized feelings such as shame.³³ If this mechanism fails or if the patient exhibits high impulsivity, binge eating may assist in the management of negative emotions.

The results of this study revealed that there may be a transfer of negative self-perceptions and emotions onto the body when evaluating body shape. Therefore, the evaluation of BID should be replaced with a cognitive-affective one. This change is considered necessary because individuals with ED do not experience a change in body perception; instead, they engage in a negative evaluation of their bodies.^{32,33,38}

4.1. Strengths and clinical implications

The methodology used in this study could be easily replicated. It categorizes the perceptual component of body image into visual and non-visual images, making it easier to understand body image. The visual image could respond to a social bias influence, whereas the non-visual image could respond to an emotional bias. This may help promote specific interventions for patients with ED who have recognized ALEs to achieve a better outcome, such as the narrative approach or multiple access psychotherapy, where the therapist adapts the strategy according to the patient's report.³² ED-trained clinicians performed the diagnostic evaluation using the DSM5 diagnostic guidelines.²² The assessment included a control group of healthy participants and a study group of patients with affective pathology. This approach differs from conventional studies that typically focus only on the ED population. In addition, a dimensional perspective was used to comprehensively examine the common aspects across all treatable EDs.³⁹

Our findings suggest that BID is not primarily based on social influence. Preventive interventions to reduce ED

symptoms usually attempt to change/criticize the ideal image of a thin body. Therapeutic interventions should focus on identifying patients who have experienced interpersonal ALEs during childhood. This will facilitate the application of appropriate interventions based on reestablishing a secure attachment through a therapeutic relationship, thereby enabling patients to reconstruct a positive body image.^{13,32}

4.2. Limitations

Regarding the study limitations, the small number of participants in each subgroup should be noted, particularly in the RMDD group. This is because the sample was collected during the COVID-19 pandemic. In addition, the ED sample was heterogeneous because it included patients with active disease and patients who had recovered, the trauma assessment was retrospective without the possibility of establishing cause-effect relationships, and the assessment was observational and non-experimental. Although retrospective trauma assessment may have recall bias, only a few false positives have been reported in other studies, and the questionnaires were administered anonymously, which may encourage honest responses.⁴⁰ Finally, due to the small sample size, a more robust statistical analysis could not be performed.

5. Conclusion

On closing our eyes, we experience internal or external sensory experiences that may be pleasant or unpleasant. Consequently, the negative perception of BID experienced by patients with ED is arguably attributed to unresolved emotions rather than social pressure.^{30,32,33}

The results of this study suggest that impulsivity and perfectionism act as non-specific risk factors for ED development and that experiencing a pre-13 interpersonal ALE could be a risk factor for the development of BID, impulsivity, and perfectionism in adulthood. On the contrary, BID in patients with ED appears to have a non-visual component that is likely related to negative internal emotions resulting from childhood ALEs. In addition, individuals with childhood ALEs may seek to control their bodies due to the presence of unacknowledged emotions. Thus, to identify interpersonal risk situations, body image should not be considered as an independent factor but as a dimension that can be modified through early intervention strategies during childhood.

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Conflict of interest

The authors declare that they have no competing interests. The authors alone are responsible for the content and writing of the paper.

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Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Miguel University Hospital (date of approval: September 2020). All participants provided written form consent.

Consent for publication

All participants gave written consent to publish the results of the study after concealing any identifying information

Availability of data

Data are available from the corresponding author upon reasonable request.

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