Eating disorders among borderline patients: understanding the prevalence and psychopathology

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Abstract
Background: Common comorbidity and the shared psychopathology in borderline personality disorder (BPD) and feeding and eating disorder (FED) resulted in conceptualization of the relationship theory between disordered eating behaviors (DEB), alexithymia, depression, and anxiety. Therefore, the present study aims at investigating the FED prevalence in patients with BPD and evaluating the relationship between DEB, alexithymia, anxiety, and depression.

Methods: This cross-sectional study was performed from August 2018 to November 2019; 110 patients with BPD and 110 healthy people were studied in this research. The participants were selected by systematic random sampling out of the patients referring to Baharan psychiatric hospital in Zahedan, Iran, with the sampling interval of 3. The subjects were evaluated by demographic data form, the 26-item eating attitudes test (EAT-26), 20-item Toronto alexithymia scale (TAS-20), Beck anxiety disorder (BAI), and Beck depression inventory-II (BDI-II).

Results: The results show a 65.4% (n = 72) prevalence of FED in borderline patients; the highest and lowest prevalence rates are reported for avoidant/restrictive food intake disorder (ARFID) and bulimia nervosa, respectively. The highest mean score of TAS-20 is reported in anorexia nervosa. The regression analysis results show that anxiety and depression play a mediating role in the relationship between alexithymia and DEB.

Conclusions: The results suggest that alexithymia should be paid clinical attention as a trait and distress-independent construct in the BPD and FED comorbidity.

Plain English Summary
FED and BPD are common psychiatric problems amongst the population. Many people who suffer from these disorders also have difficulties dealing with their emotions: they struggle recognizing and talking about their emotions (a psychological characteristic called “alexithymia”) as well as regulating their emotions appropriately. Common comorbidity and the shared psychopathology in BPD and FED resulted in conceptualization of the relationship theory between disordered eating behaviors (DEB), alexithymia, depression, and anxiety. As achieving an improved understanding of the role of emotions in the comorbidity of BPD and FED can help screening, enhance treatment protocols, and provide a
better understanding of the etiological and maintenance factors involved in this comorbidity, it seems necessary to investigate the relationship between alexithymia, anxiety, depression, and DEB in more details. Therefore, the present study aims at investigating the FED prevalence in patients with BPD and evaluating the relationship between DEB, alexithymia, anxiety, and depression.

Background

BPD is a chronic and disabling disorder, imposing many costs on societies by symptoms, such as severe functional impairments, high risk of suicide, negative effect on the course of depressive disorders, and extensive use of treatments [1]. Despite its 6% prevalence rate in the general population, this multidetermined disorder is observed in a significant percentage of people with FED; the comorbidity rate has been reported to be 14–53% in different studies [2–4]. Thus, this question is raised: is this high comorbidity an indicator of a partially causal relationship [5]? Despite expanded studies, the question is still unanswered [2]. In 2001, Dolan et al. [6] proposed a useful framework for organizing different theoretical models; the models investigated the comorbidity of psychiatric disorders. One of them was the spectrum/subclinical model, supposing BPD and FED to be similar concerning etiologies and action mechanisms [2, 6]. This assumption led to the inference that the use of emotion regulation strategies, including rumination, suppression, and avoidance by BPD and FED patients, may indicate the important role of emotion regulation (as a transdiagnostic construct) in the evolution of these disorders [7]. In this regard, researchers have indicated that alexithymia can be involved in many different pathologies, such as BPD and FED, by preventing the regulation of negative emotions [8, 9]. For example, Zlotnick et al. [10] and Wolff et al. [11] indicated that borderline patients usually could not recognize emotions and their causes. Moreover, Mitchell and Mazzeo [12] found that a person’s inability to recognize and discriminate emotional states can lead to an exaggerated interest in the physical details of his/her body by emotional void. Although there is evidence implying the alexithymia effect on emotion regulation, little information has been obtained about this process so far [13]. Nevertheless, recent studies have suggested that unawareness of emotions leads to the inability to successfully regulate them and, consequently, chronically increased autonomic arousal [14]. Pandey and Mandal [15] suggested that the relationship between alexithymia
and overestimated perceived arousal results from the association of alexithymia with anxiety. Later, following the introduction of these issues, several authors considered alexithymia as a personality trait that can give rise to anxiety and depression by causing problems in the management of emotions, anxiety, and depression [16]. Approving this hypothesis, studies showed that the core cognitions underlying personality psychopathology in FED are specifically associated with anxiety and depression [17]. Furthermore, the results of several studies suggested that, compared with the normal population, anxiety and depression are significantly more prevalent among FED and BPD patients; it can be mainly explained by high alexithymia in these patients [13, 16, 18]. Thus, supposing that FED is a subtype of emotional disorders, deficits in emotional processing observed in FED should be fully mediated by anxiety and depression. In other words, if FED form a different pathology, only anxiety and depression must mediate the relationship between alexithymia and DEB [19]. Consistent with the complete mediation hypothesis, Eizaguirre et al. investigated the relationship between alexithymia, anxiety, and depression in FED, and they found that anxiety and depression can mediate the relationship between alexithymia and DEB [16].

As achieving an improved understanding of the role of emotions in the comorbidity of BPD and FED can help screening, enhance treatment protocols, and provide a better understanding of the etiological and maintenance factors involved in this comorbidity, it seems necessary to investigate the relationship between alexithymia, anxiety, depression, and DEB in more details. For this purpose, the present research seeks five goals: (1) comparing the mean scores of BAI, BDI-II, TAS-20, and EAT-26 in the three studied groups (including BPD patients, BPD + FED patients, and healthy control group); (2) comparing the frequency of FED in the three studied groups; (3) comparing the mean scores of TAS-20 in terms of different FED subtypes in patients with BPD and without FED; (4) determining the correlation between BAI, BDI-II, TAS-20, and EAT-26; (5) investigating the mediating role of anxiety and depression in the relationship between alexithymia and DEB.

Methods

Participants

This cross-sectional study was performed from August 2018 to November 2019; in this study, 110 BPD
patients and 110 healthy people were investigated. The sample size was calculated based on the study performed by Eizaguirre et al. [16]. With the assumption of \( r = 0.24 \), the probability of type I error and type II error were obtained as \( (\alpha = 0.05 \text{ and } Z_{1-\alpha/2} = 1.96) \) and \( (\beta = 0.2 \text{ and } Z_{1-\beta} = 0.84) \), respectively; the value of correlation coefficient was approximated to the normal distribution, and the value of \( r \) in normal distribution was calculated by the formula \( C = 0.5 \times \ln \left( \frac{1 + r}{1 - r} \right) \). Finally, the total sample size was obtained as 110 people based on the formula \( N = \left( \frac{Z_{\alpha} + Z_{\beta}}{C} \right)^2 + 3 \). The participants were selected out of the patients referring to Baharan psychiatric hospital in Zahedan, Iran, by systematic random sampling with a sampling interval of 3. The inclusion criteria included: (1) getting a score above 10 in borderline personality inventory (BPI) and approved diagnosis of the disorder based on structured clinical interview for DSM-5 personality disorders (SCID-5-PD); (2) the age range of 18-35 years; (3) the ability to read and write with reading comprehension; (4) getting a score of \( \leq 22 \) in general health questionnaire (GHQ-28) for healthy people. The exclusion criteria included: (1) severe and acute physical illness; (2) brain traumatic injury; (3) the comorbidity of bipolar disorder; (4) the comorbidity of schizophrenia and other psychotic disorders; (5) epileptic disorder; (6) intellectual disability; (7) mixed personality disorder; (8) using any drug or substance that causes anorexia and bulimia; (9) failing to fill the questionnaires properly.

**Procedures**

After approval of the research project in the ethics committee of the Medical Faculty of the ZAUMS Zahedan (IR.ZAUMS.REC.1398.212), the informed consent form was distributed among the participants. In order to observe the Declaration of Helsinki, participation in the study was optional, and the participants could leave the study for any reason. After receiving informed consent from the participants, demographic information form, EAT-26, TAS-20, BAI, and BDI-II were distributed among them. Next, all the participants were evaluated in terms of being affected by FED using structured clinical interviews for DSM-5: research version (SCID-5-RV). For keeping the participants’ information private, the questionnaires were anonymous.

**Measures**
Alexithymia was assessed with the Persian version of the TAS-20; a 20-item self-report questionnaire scored based on a five-point (1-5) Likert scale. The minimum score is 20, and the maximum score is 100. The scores of 61≤ indicate alexithymia. In Iran, Besharat [20] has reported the Cronbach’s alpha coefficient of the overall alexithymia and its three subscales, ranging between 0.72 and 0.85.

Anxiety symptoms were assessed with the Persian version of the BAI; a self-report 21-item questionnaire scored based on a four-point (0-3) Likert scale. The minimum and maximum scores are 0 and 63, respectively. Kaviani et al. [21] have reported acceptable reliability and validity for the Persian version of the questionnaire (Cronbach’s alpha = 0.92).

Depressive symptoms were assessed with the Persian version of the BDI-II; a self-report 21-item questionnaire scored based on a four-point (0-3) Likert scale. The minimum and maximum scores are 0 and 63, respectively. Ghassemzadeh et al. [22] have reported acceptable reliability and validity for the Persian version of the questionnaire (Cronbach’s alpha = 0.87).

DEB symptoms were assessed with the Persian version of the EAT-26. In this 26-item questionnaire, the minimum and maximum scores are equal to 0 and 78, respectively. A score above 20 indicates the probability of being affected by FED. Ahmadi et al. [23] have reported acceptable reliability and validity for the Persian version of this questionnaire (internal consistency = 0.76-0.92).

In BPI, a 53-item questionnaire (answered by yes or no), if the person’s score for the 20 items of the cutoff score is above 10, the person is highly likely to be affected by BPD. Mohammadzadeh [24] has reported acceptable reliability and validity for the Persian version of this questionnaire (Cronbach’s alpha = 0.70-0.85).

SCID-5-PD is a semi-structured clinical interview for researchers and clinicians, and it evaluates DSM-5 personality disorders under three clusters of A, B, C, and other specific personality disorders. Several studies have reported acceptable reliability and validity for SCID-5-PD [25].

SCID-5-RV is a semi-structured interview for major DSM-5 diagnoses, and it is performed by a trained clinician or health expert who is familiar with the diagnostic criteria and classification of disorders in DSM-5. Several studies have reported acceptable reliability and validity for SCID-5-RV [26].

GHO-28 is a 28-item questionnaire in which items are scored in the range of 0-3. The overall score
ranges between 0 and 84. Getting a score of ≤22 indicates a person’s mental health. In Iran, Ebrahimi et al. [27] have reported acceptable reliability and validity for this scale (Cronbach’s alpha = 0.97).

Data analysis

Statistical analysis was performed by descriptive statistics, including mean and standard deviation. Kruskal-Wallis test was used for demographic comparison of the three studied groups, and analysis of variance (ANOVA) was used to compare the mean scores of BAI, BDI, TAS-20, and EAT-26. The correlation between the variables was evaluated by the Pearson correlation coefficient. The model proposed by Baron and Kenny [28] was used to investigate the mediating role of anxiety and depression in the relationship between alexithymia and DEB. According to this model, mediation is approved by the following four conditions: (1) the independent variable (alexithymia) affects the dependent variable (DEB); (2) the independent variable affects the mediator variables (anxiety and depression); (3) regarding the effect of the independent variable, the mediator variable affects the dependent variable; (4) regarding the effect of the mediator variable, the effect of the independent variable on the dependent variable is decreased. Hierarchical multiple regression was used to investigate the predicting role of the studied variables. Furthermore, given the relationship of sociodemographic factors (including age, gender, marital status, education level, and income) with anxiety, depression [29-32], and FED [33, 34] found in previous studies, the factors as mentioned above were considered as covariates in regression analysis. Meanwhile, data analysis was done by SPSS 25, and the significance level was considered as P < 0.05.

Results

Preliminary analysis

In this study, 110 patients affected by BPD and 110 healthy people were evaluated in three groups, including BPD patients, BPD + FED patients, and the healthy control group. Table 1 presents the participants’ sociodemographic information. The results of the table showed no significant difference between the studied groups concerning sociodemographic factors. Moreover, there was a significant difference between the scores of BAI (F (2, 217) = 2005.08, p < 0.001), BDI (F (2, 217) = 866.85, p < 0.001), TAS-20 (F (2, 217) = 671.54, p < 0.001), and EAT-26 (F (2, 217) = 521.03, p < 0.001) in the
three groups; the highest scores were reported in BPD + EFD group, and the lowest scores were reported in the healthy control group.

The results of the SCID-5-RV interview indicated a 65.4% prevalence of FED in patients with BPD. The highest and lowest frequencies were reported for ARFID (51.3%) and bulimia nervosa (6.9%), respectively. No FED case was observed in the other two groups (figure 1). Furthermore, the comparison of the mean scores of TAS-20 by FED showed the highest score for anorexia nervosa (figure 2).

**Associations of study variables**

The results of table 2 suggested a significant positive correlation between the scores of EAT-26 and BAI (r = 0.59; p < 0.01), BDI (r = 0.54; p < 0.01), and TAS-20 (r = 0.60; p < 0.01). Furthermore, there was a significant positive correlation between the scores of TAS-20 and BAI (r = 0.65; p < 0.01) and BDI (r = 0.56; p < 0.01).

**Mediation analysis**

The regression analysis results showed that alexithymia level (β = -0.666; p < 0.001) could predict DEB. Also, alexithymia could predict anxiety (β = 0.180; p < 0.05) and depression (β = 0.182; p < 0.05). After considering the predictive effect of anxiety (β = 0.337; p < 0.001) and depression (β = 0.337; p < 0.001), the relationship between DEB (β = -0.511; p < 0.001) and alexithymia level (β = 0.207; p < 0.001) became less significant; it suggested the mediating role of anxiety and depression based on the model proposed by Baron and Kenny. Meanwhile, all the regression analysis stages were done by controlling the effect of sociodemographic factors.

**Discussion**

In this study, there is a significant difference between the scores of BAI, BDI, TAS-20, and EAT-26 in the three studied groups; the highest scores are reported in the BPD + FED group, and the lowest scores are reported in the healthy control group. These findings are consistent with the results of the study performed by Eizaguirre et al. [16], Nowakowski et al. [18], and Gilboa-Schechtman et al. [19] who show that the scores of TAS-20, BAI, BDI, and EAT-26 in the FED group are higher than the healthy control group.
In the present study, a higher FED prevalence is reported among BPD patients than the previous studies (65.4% vs. 53%-14). The highest and the lowest frequencies are reported for ARFID (51.3%) and bulimia nervosa (6.9%), respectively; whereas, in the study performed by Zanarini et al. [2, 35], the highest prevalence of FED is reported among borderline patients and those affected by eating disorders not otherwise specified (EDNOS) that is equivalent of diagnosis of other specified feeding or eating disorders (OSFED) in DSM-5. In order to explain these statistical differences, it can be stated that in previous studies, FED frequency among BPD patients has been done based on DSM-III-R and DSM-IV-TR criteria that are different from DSM-5 criteria. Moreover, ARFID is a new diagnosis in DSM-5 that is very similar to bulimia nervosa; however, the difference is that there is no distress about body shape or size or fear of fatness in ARFID [26]. No subcategory of FED is observed in BPD and healthy control groups. It suggests that EAT-26 can be considered as a useful screening instrument (with a cutoff point of above 20) [23] for diagnosing different types of FED in borderline patients. The comparison of mean scores of TAS-20 by FED reveals the highest score in anorexia nervosa. This finding is consistent with the results of the studies performed by Eizaguirre et al. [16], Nowakowski et al. [18], and Gilboa-Schechtman et al. [19] and inconsistent with those of the studies performed by Cochrane et al. [9], Troop et al. [36], and Berthoz et al. [37].

The present research findings show that there is a significant positive correlation between the scores of EAT-26 and BAI, BDI, and TAS-20. Moreover, there is a significant positive correlation between the scores of TAS-20 and BAI and BDI. These findings suggest that in patients affected by BPD + FED, alexithymia is closely related to anxiety and depression. Here, this question is raised: is alexithymia either a state variable or a trait variable? There is strong evidence suggesting that alexithymia is not only a by-product of FED symptomatology. However, there is mixed evidence of whether alexithymia is independent of general distress [16, 18, 19]. Nevertheless, several studies indicate that elevated alexithymia scores become eliminated by controlling the effect of distress; however, other studies suggest that in FED patients, elevated alexithymia scores remain constant even by controlling the effect of anxiety and depression [18]. In the current study, the regression analysis results show that the role of alexithymia in the prediction of DEB remains constant even by controlling the effect of
anxiety and depression. Although the mediating role of anxiety and depression in the relationship between alexithymia and DEB is approved based on Baron and Kenny’s model, the predictive effect of alexithymia is not eliminated by the mediator variables. This finding suggests that alexithymia is mainly a trait rather than a state. In explanation of the present research results, Schmidt et al. [38] indicate that pharmacotherapy with antidepressants can decrease depression but not alexithymia in patients with high levels of alexithymia and depression. Moreover, genetic studies suggest that alexithymia has its own heritability component that cannot be fully explained by depression or genetic susceptibility to general distress and psychopathology [39]. As a result, although the relevant evidence is mixed, it is suggested to pay clinical attention to alexithymia as a distress-independent construct [18].

The present research findings have many implications for nosology and interventions. First, the FED is likely to be a subtype of emotional disorders that, in turn, should affect the prediction of the course of these afflictions. For example, if depressive episodes as a primary disorder constitute the core of these conditions, then the risk of developing depressive episodes remains high even with the recovery of the FED. Second, this nosological shift may also affect the type of treatment. If anxiety and depression, for instance, are diagnosed as primary disorders or secondary to alexithymia, the treatment will be different. Third, emotional awareness normalization and emotion regulation may be regarded as recovery markers beyond symptom reduction [19].

Thus, future studies should focus on some methodological constraints, including sole reliance on self-report measures of alexithymia (due to memory bias and demand characteristics), lack of experimental studies, lack of ethnic differences, and negative emotions exclusively.

Conclusions
In short, a better understanding of emotions in FED can strengthen treatment protocols and help to recognize the involved etiological and maintenance factors. It is, indeed, so important to differentiate between primary and secondary alexithymia since, as proposed by Sexton et al. [40], cognitive therapies are more effective on primary alexithymia than dynamic ones. Whereas, secondary alexithymia responses to a wide range of treatments. However, recent studies have shown that
although psychological treatments for FED result in a significant decrease in pre-treatment to post-treatment alexithymia scores, post-treatment alexithymia scores are higher compared with the control group [18]. Nevertheless, further studies are needed to identify the potential mediators of these changes.

Abbreviations
ANOVA: analysis of variance; ARFID: Avoidant/restrictive food intake disorder; BAI: Beck anxiety inventory; BDI: Beck depression inventory; BPD: borderline personality disorder; BPI: Borderline personality Inventory; DEB: Disordered eating behavior; EAT-26: eating attitudes test-26 item; EDNOS: Eating disorders not otherwise specified; FED: feeding and eating disorders; GHQ-28: General health questionnaire; OSFED: Other specified feeding or eating disorders; SCID-5-RV: Structured clinical interviews for DSM-5: research version; SCID-5-PD: Structured clinical interview for DSM-5 personality disorders; TAS-20: 20item-Toronto alexithymia scale.

Declarations

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Authors’ contributions
Author reads and approved the final manuscript.

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Availability of data and materials
The datasets generated and analyzed during the current study are not publicly available because no consent for making the data publicly available was collected from the participants. However, the data are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
The study was approved by the ethics committee of the Medical Faculty of the ZAUMS Zahedan (IR.ZAUMS.REC.1398.212) and all procedures were in accordance with the latest version of the Declaration of Helsinki. Prior to participation, written informed consent was obtained from all
participants and their parents/legal guardians after a comprehensive explanation of the study procedures.

**Consent for publication**

Not applicable.

**Competing interests**

The author declares that he has no competing interests.

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Tables

Table 1: Comparisons among the three groups on the socio-demographic factors, BAI, BDI, TAS-20, and EAT-26

| Variables          | Subvariables       | Healthy Control (n = 110) | BPD Patients (n = 38) |
|--------------------|--------------------|--------------------------|-----------------------|
|                    | N (%)              | N (%)                    |
| Age                |                    |                          |
| 18-23              | 37 (33.6)          | 10 (26.3)                |
| 24-29              | 43 (39.1)          | 16 (42.1)                |
| 30-35              | 30 (27.3)          | 12 (31.6)                |
| Gender             |                    |                          |
| Male               | 28 (25.5)          | 17 (44.7)                |
| Female             | 82 (74.5)          | 21 (55.3)                |
| Marital status     |                    |                          |
| Never married      | 57 (51.8)          | 22 (57.9)                |
| Married            | 28 (25.5)          | 16 (42.1)                |
| Cohabiting         | 5 (4.5)            | 0 (0)                    |
| Widowed            | 2 (1.8)            | 0 (0)                    |
| Divorced           | 13 (11.8)          | 0 (0)                    |
| Separated          | 5 (4.5)            | 0 (0)                    |
| Degree level       |                    |                          |
| Non-degree         | 45 (40.9)          | 9 (23.7)                 |
| High school diploma| 38 (34.5)          | 4 (10.5)                 |
| Academic degree    | 27 (24.5)          | 25 (65.8)                |
| Income             |                    |                          |
| ＜ ＄100            | 73 (66.4)          | 23 (60.5)                |
| ＄100               | 37 (33.6)          | 15 (39.5)                |
|                    | ** M (SD)          | ** M (SD)                |
| BAI                | 7.94 (6.20)        | 50.65 (8.91)             |
| BDI                | 3.53 (5.62)        | 26.07 (4.46)             |
| TAS-20             | 28.10 (7.18)       | 53.94 (12.95)            |
| EAT-26             | 1.32 (2.11)        | 8.55 (5.19)              |

Note: BAI: Beck anxiety inventory; BDI: Beck depression inventory; BPD: borderline personality disorder; EAT-26: 20item-Toronto alexithymia scale.

*p < 0.05 is significant; **p < 0.01 is significant; ***p < 0.001 is significant.

Table 2: Correlations among BAI, BDI, TAS-20, and EAT-26
| Variables | M (SD)   | 1  | 2  | 3  | 4  |
|-----------|---------|----|----|----|----|
| 1. BAI    | 58.28 (7.95) | 1  |    |    |    |
| 2. BDI    | 34.47 (8.42)  | 0.54** | 1  |    |    |
| 3. TAS-20 | 70.34 (16.13) | 0.65** | 0.56** | 1  |    |
| 4. EAT-26 | 21.33 (11.94) | 0.59** | 0.54** | 0.60** | 1  |

**Note:** BAI: Beck anxiety inventory; BDI: Beck depression inventory; EAT-26: eating attitudes test-26 item; TAS-20: 20item-Toronto alexithymia scale.

*p < 0.05 is significant; **p < 0.01 is significant; ***p < 0.001 is significant.

Table 3: Summary of multiple regression analysis between BAI, BDI, TAS-20, and EAT-26 by controlling for socio-demographic variables (included age, gender, marital status, degree level, and income)

| Predicted variables | Variables in equation | $\Delta R^2$ | $\Delta F (df1, df2)$ | B(β) | SE |
|---------------------|-----------------------|--------------|-----------------------|------|----|
| EAT-26              | TAS-20                | 34.4%        | 57.77 (1, 103)***     | 0.44 (0.60)*** | 0.05 |
| BAI                 | TAS-20                | 43.4%        | 44.15 (2, 102)***     | 0.24 (0.50)*** | 0.04 |
|                      | BDI                   |              |                       | 0.44 (0.25)**  | 0.08 |
| BDI                 | TAS-20                | 35.8%        | 30.57 (2, 102)***     | 0.19 (0.37)*** | 0.05 |
|                      | BAI                   |              |                       | 0.32 (0.30)**  | 0.11 |
| EAT-26              | TAS-20                | 10.2%        | 10.05 (2, 101)***     | 0.21 (0.28)**  | 0.07 |
|                      | BAI                   |              |                       | 0.40 (0.27)**  | 0.15 |
|                      | BDI                   |              |                       | 0.35 (0.24)**  | 0.13 |

**Note:** BAI: Beck anxiety inventory; BDI: Beck depression inventory; EAT-26: eating attitudes test-26 item; TAS-20: 20item-Toronto alexithymia scale.

*p < 0.05 is significant; **p < 0.01 is significant; ***p < 0.001 is significant.

Figures
Figure 1

Population pyramid count eating disorders by borderline personality disorder (BPD) with or without feeding eating disorders (FED) and healthy control.
Figure 2

Simple line mean of 21-item-Toronto alexithymia score (TAS-20) by feeding and eating disorders among borderline patients