Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity
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ORIGINAL ARTICLE

Personality traits associated with eating disorders and obesity in young Argentineans

Sebastian Jesús Garrido[1] · Paola Noelia Funes[2] · María Emilse Peñaloza Merlo[2] · Marcos Cupani[1]

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Abstract

Purpose Few studies have been conducted on Latin American population to explore how facets of personality, eating disorders, and obesity are related. The main purpose of this study was to explore the personality traits among patients diagnosed with anorexia nervosa ($n=23$), bulimia nervosa ($n=32$), and obesity ($n=16$), in comparison to control group ($n=82$).

Methods A total of 153 individuals participated in the study, 125 were female (81.7%) and 28 were male (18.3%). Participants' ages ranged between 18 and 37 years (mean 24.21, SD 4.84) and they were all native Spanish speakers, living in the city of Córdoba, Argentina. Participants completed the Eating Disorder Inventory-2 and the IPIP-NEO Personality Inventory.

Results In this study, the subjects diagnosed with anorexia in comparison to control group showed high and significant scores in neuroticism and openness to experience and low scores on agreeableness, conscientiousness, and extraversion. For their part, the subjects diagnosed with bulimia, in comparison to the control group, had higher and significant scores on neuroticism, extraversion, and conscientiousness. Lastly, the patients with obesity in comparison to the control group presented high and significant scores on neuroticism and low and significant scores on agreeableness, extraversion, conscientiousness, and openness to experience.

Conclusions The results obtained from this study support previous research devoted to the study of eating disorders and obesity. This situation favors the valid and relevant nature of the study of personality traits as factors that contribute to explaining behavior disorders associated with eating pathologies. This is a preliminary and necessary step for future research to examine the risky combination of personality traits and anorexia, bulimia, and obesity in the local context using a larger and more generalized sample.

Keywords Personality traits · Anorexia nervosa · Bulimia nervosa · Obesity

Introduction

Axis 1 of Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-V) [1] includes eating disorders, which are composed of different subclasses of disorders, such as eating disorder not otherwise specified, binge eating disorder, anorexia nervosa and bulimia nervosa (the latter will be studied here). Anorexia is characterized by self-inflicted weight loss and bulimia by recurrent episodes of bingeing and purging. An irrational overvaluation of the importance of controlling food, weight, and body shape represents the specific clinical features [2]. Obesity is not a mental disorder but a complex medical condition commonly assessed by using the body mass index (BMI). According to this index, a number greater than 30 kg/m^2 indicates the person has an obesity problem [3].

In reference to comorbidity of anorexia, bulimia and obesity, the literature reported that there is a reciprocal relationship between obesity and eating disorder behaviors, in which each contributes to the other onset and maintenance [4]. For example, in patients with a history in feeding disorder, like binge eating and bulimia nervosa, there is a greater chance

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✉ Sebastian Jesús Garrido
sebajgarrido@gmail.com

[1] Instituto de Investigaciones Psicológicas, IIPsi, Unidad Ejecutora CONICET, Facultad de Psicología, Universidad Nacional de Córdoba, Enfermera Gordillo s/n, Córdoba Capital, Argentina

[2] Facultad de Psicología, Universidad Nacional de Córdoba, Enfermera Gordillo s/n, Córdoba Capital, Argentina

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for the development of obesity than in those without a history of eating disorders [5].

In interaction with another mental disorder, it must be mentioned that among patients with anorexia and bulimia, the most common Clinical Disorders of Axis I is major depression [6, 7]. Also, substance abuse is related with bulimic behaviors bingeing and purging and bingeing subtype of anorexia, but substance abuse is not associated with anorexia (restricting-type). In addition, anxiety disorders have an important relation in etiology and maintenance of anorexia and bulimia [6]. Likewise, obesity was associated with mood disorders (including depression and bipolar disorders) and schizophrenia [8, 9].

With respect to the interaction among bulimia, anorexia and personality disorders of Axis II, paranoid (cluster A), borderline (cluster B), avoidant, dependent and obsessive–compulsive disorder (cluster C) are the most commonly diagnosed comorbid disorder [6, 10, 11]. Although both eating disorders shared comorbidity of personality disorder, avoidant, obsessive–compulsive were more prevalent in anorexia than in bulimia, but borderline disorder and paranoid disorder were more prevalent in bulimia than in anorexia. In addition, people diagnosed with obesity, the most common personality disorders of axis II are avoidant, dependent, and obsessive–compulsive disorder (cluster C) [12].

With respect to the personality factors that occur more frequently in subjects that suffer some disease related to eating problems, it was found that the big-five personality traits allowed the gathering of data about personality and pathologic behavior related to eating [13]. This approach posits that the basic personality structure is composed of five major higher-order factors (personality traits: neuroticism, openness to experience, conscientiousness, extraversion, and agreeableness) and various low-level facets [14].

Some studies have suggested that high levels in the neuroticism and openness to experience traits [2, 13] and low levels of conscientiousness, extraversion, and agreeableness [2, 15] are risk factors for bulimia. With regards to anorexia nervosa, MacLaren and Best [13] reported that extraversion and agreeableness personality traits correlate negatively with these EDs while the openness to experience factor does so in a positive manner. In relation to the personality factors connected to obesity, it was reported that low levels in conscientiousness, high levels of the neuroticism and impulsiveness factors, are associated with a high likelihood for developing obesity [16], while, to a lesser extent, they are related to conscientiousness and openness to experience [17].

Although EDs and obesity affect world population, most studies on these pathologies are from Western countries, mainly the USA [18]. Recently, the study on these behavioral problems has spread to non-Western countries other from Japan, like the Middle East and the People's Republic of China [19]. In Argentina, no research has been made so far to explore the association between facet, trait personality and eating disorders in the local population. The study of these variables in our context would be of major importance since EDs and obesity have characteristics that vary according to the specific conditions of each population under study (sex, socioeconomic status, and ethnic minorities). It is necessary to mention that obesity is not a mental disorder; however, in the present study, patients with obesity are included because they are involved in pathological eating patterns. In addition, it is possible to recognize a strong association between obesity and eating disorders [1] as well as among eating disorders, obesity, and personality [13].

Purpose of the current study

Considering the scarce information in our community about the implications of personality factors at the onset of symptomatic expression and the development of eating disorders and obesity, the aim of this study is to determine the relationship of personality traits with anorexia nervosa, bulimia, and obesity using clinically diagnosed samples and a control sample.

Methods

Participants

A total of 153 individuals participated in the study, 125 were female (81.7%) and 28 were male (18.3%). Participants' ages ranged between 18 and 37 years (mean 24.21, SD 4.84), they were all native Spanish speakers living in the city of Córdoba, Argentina. The participants were organized into four groups: group 1: patients who met the criteria for anorexia ($n=23$); group 2: patients diagnosed with bulimia ($n=32$); group 3: patients diagnosed with obesity ($n=16$); and group 4: subjects not diagnosed with EDs and obesity ($n=82$). The subjects diagnosed with anorexia, bulimia, and obesity were under treatment in specific institutions of the city of Córdoba. The control group was mostly university students who had never been diagnosed with EDs or obesity. With regard to the economic situation of the participants, we consider their insertion in the labor field as well as their perception of their economic situation (which was classified as low, medium, and high). As a result, 52.5% of the sample belonged to the labor force. In addition, when asked about their perceptions of their economic situation (and considering the classification given by the National Institute of Statistics and Censuses), the sample was representative of upper-middle and lower-middle socio-economical classes. Table 1 shows the sociodemographic and treatment characteristics of the sample.

Table 1 Sociodemographic characteristics and treatment characteristics as a function of the clinical condition

	Clinical condition				Total patient group ($n=71$)
	CG ($n=82$)	Anorexia ($n=23$)	Bulimia ($n=32$)	Obesity ($n=16$)	
Age					
Mean score	24.68	24.00	21.22	28.06	23.66
SD	3.701	6.620	3.757	6.071	5.926
Sex					
Women	74.4	91.3	100	68.8	90.1
Men	25.6	8.7	0.0	31.3	9.9
Educational level					
Elementary (incomplete)	0.0	4.3	3.1	0.0	2.8
Elementary (complete)	0.0	0.0	0.0	0.0	0.0
High school (incomplete)	1.2	17.4	18.8	6.3	15.5
High school (complete)	3.7	43.5	31.3	18.8	32.4
Tertiary (incomplete)	1.2	4.3	12.5	0	7.0
Tertiary (complete)	3.7	8.7	0	25	8.5
University (incomplete)	74.4	17.4	31	50	31.0
University (complete)	13.4	4.3	3	0	2.8
Postgraduate	2.4	0.0	0.0	0.0	0.0
Treatment					
Yes	0	95.7	100	31.3	83.1
No	100	4.3	0	68.8	16.9
Length of treatment (weeks)					
Mean score	–	18.00	14.97	14.13	15.76
SD	–	21.121	12.673	44.702	25.339

Data are presented as percentage of subjects that fell into each category. For continuous variables, data are presented as means and standard deviation in each category

CG control group

Instruments

The Eating Disorder Inventory-2 (EDI-2)

The EDI-2 [20] is a self-report questionnaire that consists of 91 questions comprising three subscales measuring eating disorder symptoms. The subscales are drive for thinness (DT), bulimia (B), and body dissatisfaction (BD); and eight general psychological features related to eating disorders: ineffectiveness (IN), perfectionism (PE), interpersonal distrust (ID), interoceptive awareness (IA), maturity fears (MF), asceticism (AS), impulse regulation (IR), and social insecurity (SI). In the present study, eight scales showed acceptable values of internal consistency ($\alpha \geq 0.80$) and three scales showed low reliability values [PE ($\alpha=0.64$), MF ($\alpha=0.66$), AS ($\alpha=0.67$)]. Taking this into account, the reliability of the factorial scores [21] was calculated using the software Factor 9.3 [22]. This analysis yielded reliability values between 0.72 and 0.96. Factor scores are the weighted sum of the responses to items, where the weighted value is related to the estimation of the variance that each item shares with the latent trait. Factorial scores were used for the regression analyses.

IPIP-NEO

The IPIP [23] is a 300-item inventory designed to measure constructs analogous to those assessed by the 30-facet scales in the NEO Personality Inventory (NEO PI-R) [24]. We administered the IPIP items with a 5-point, Likert-type scale ranging from 1 (very inaccurate) to 5 (very accurate) as in the original instrument. Goldberg [23] indicates that the scales of this inventory show a mean alpha reliability of 0.80, surpassing the mean alpha of 0.75 for the original NEO PI-R scales. The IPIP-NEO scales correlated on average $r=0.73$ ($r=0.94$ when corrected for attenuation due to scale unreliability) with the NEO PI-R scales on which they were based. In the present study, the Spanish version of the IPIP-NEO [25] was used to assess different facets of personality. The adapted version shows adequate reliability and validity. In the present research, adequate values in reliability indices from $\alpha=0.54$ to $\alpha=0.90$ for narrow personality traits and

indices from $\alpha = 0.90$ to $\alpha = 0.96$ for broad personality traits were obtained. The reliability of the factorial scores was calculated. This analysis yielded reliability values between 0.71 and 0.91. We decided to use the factorial scores for the analyses (see Table 3).

Procedure

The instruments mentioned above were administered individually for the collection of data. Participants were given an informed consent sheet explaining the purpose and objectives of the study as well as data confidentiality and voluntary and anonymous participation conditions. Due to the length of the questionnaires, the participants could take them home and bring them back when they completed them because a deadline was stipulated. This procedure was possible with the cooperation of the institutions involved in the treatment of patients with eating disorder and the patients with obesity. Finally, it should be said that we obtained written informed consents from all the participants and the University Internal Review Board approved all the study procedures.

Statistical analysis

The routine missing values analysis of SPSS version 19.0 was used to assess the pattern of missing values [26]. The distributions of the variables were examined for skewness and kurtosis. To assess the indices of skewness and kurtosis, values lower than ± 1.00 were considered excellent while values equal to or lower than ± 2.00 were considered adequate. We split the sample into two groups: those participants diagnosed with anorexia, bulimia or obesity and those who would be part of the control group. This decision was made to avoid those participants who were not diagnosed by a professional or who did not show signs of some of the pathologies from being part of the control group. To obtain these data, a logistic regression analysis was carried out. Through this analysis, participants with bulimia, anorexia or obesity (false positive) that were not declared as such could be identified within the control group. It is worth mentioning that to carry out this analysis, the facets of the diagnostic instrument called EDI-2 were considered as independent variables and the absence or presence of disease was considered as a dependent variable. Besides, as this group did not have the diagnosis by an expert professional, the body mass index (BMI) of the subjects was also considered as additional information to the diagnostic instrument, which allowed us to detect those participants with obesity. Furthermore, an analysis of variance (ANOVA) was applied to assess the relationship of personality traits with obesity and eating disorders. To estimate the effect sizes, eta-squared (η^2) was calculated. According to Cohen's [27] criteria, η^2 values of 0.01, 0.10, and 0.25 indicate small, medium, and large effects, respectively.

Results

Data preparation

The pattern of missing values was analyzed first and one source of missing data was identified: item nonresponse. Missing data for item nonresponse ranged from 1.3 to 7.2%. Taking into account that the missing data for the EDI-2 and IPIP-NEO was greater than 5% [26], we proceeded to verify that the missing data were completely at random (MCAR). A Little's (1988) MCAR test ($\chi^2 = 13079.15$, $df = 32{,}531$, $p \geq 1.00$) supported this assumption. Based on these results, it was decided to impute the data to measure the central tendency (mode) of all the answers from one participant on the same scale. This method provides a conceptual attractive balance of accuracy and simplicity in cases of loss for lack of answers [28]. Indices of skewness and kurtosis were calculated for each 12 subscales of EDI-2 and facet scales of personality, with 37 variables presenting skewness and kurtosis values between $+1$ and -1, which are considered excellent, and five variables presenting acceptable indices of skewness and kurtosis (values < 2.0).

Logistic regression analyses

A binary logistic regression analysis was conducted using eating disorders and control group membership as the outcome variable. Self-reported EDI-2 was entered into a binary logistic regression analysis (see Table 2). In the final block, drive for thinness, bulimia, body dissatisfaction, and asceticism were significant predictors of group membership. The overall statistics for the final block were $\chi^2 = 55.06$, $df = 11$, $p < 0.001$, with 75.8% of cases classified correctly. The classification by group revealed that the highest percentage (82.9%) corresponded to the control group, followed by 67.6% for the group with eating pathologies. In the control group, 14 cases were deleted by the multinomial regression analysis.

Univariate analysis of variance

ANOVA results showed that there are significant differences in 24 out of 30 facets of personality. Table 3 shows that the groups differ in the six facets of the neuroticism factor (anxiety, anger, depression, self-consciousness, immoderation, and vulnerability), in the six facets of the extraversion factor (friendliness, gregariousness, assertiveness, activity, excitement-seeking, and cheerfulness), in four facets of the openness to experience factor (emotionality, adventurousness,

Table 2 Summary statistics for the logistic regression equation predicting categorization as eating disorders

	B	ET	Wald	gl	Sig.	OR	95% CI	
							Lower bound	Upper bound
DT	0.88	0.38	5.24	1.00	0.02	2.41	1.13	5.12
B	0.85	0.30	8.08	1.00	< 0.01	2.34	1.30	4.20
BD	0.80	0.37	4.64	1.00	0.03	2.23	1.08	4.64
IN	− 0.29	0.37	0.63	1.00	0.43	0.75	0.36	1.54
PE	− 0.16	0.24	0.46	1.00	0.50	0.85	0.53	1.36
ID	− 0.29	0.28	1.05	1.00	0.31	0.75	0.43	1.30
IA	− 0.58	0.40	2.17	1.00	0.14	0.56	0.26	1.21
MF	− 0.20	0.22	0.83	1.00	0.36	0.81	0.53	1.26
AS	− 1.14	0.40	8.27	1.00	< 0.01	0.32	0.15	0.70
IR	0.16	0.34	0.22	1.00	0.64	1.18	0.60	2.31
SI	0.18	0.36	0.26	1.00	0.61	1.20	0.59	2.42
Constant	− 0.08	0.20	0.16	1.00	0.69	0.92		

DT drive for thinness, *B* bulimia, *BD* body dissatisfaction, *IN* ineffectiveness, *PE* perfectionism, *ID* interpersonal distrust, *IA* interoceptive awareness, *MF* maturity fears, *AS* asceticism, *IR* impulse regulation, *SI* social insecurity

intellect, and liberalism), in five facets of the agreeableness factor (trust, morality, altruism and sympathy), and in three facets of the conscientiousness factor (self-efficacy and dutifulness). An inspection of the effect sizes indicates that these vary from small to large.

The post -hoc analyses with the Tukey HSD test ($p < 0.05$) showed the discrepancies among patients diagnosed with anorexia, bulimia, obesity, and the control group. These are shown in Figs. 1, 2, 3, 4 and 5. In the neuroticism dimension (Fig. 1), the factorial scores (FS) in anxiety (N1) and vulnerability (N6) facets, were significantly higher between subjects diagnosed with anorexia and bulimia than the subjects of control group. In the anger (N2) facet, the control group had significantly lower FS than the group diagnosed with Bulimia. In the depression (N3) facet, the FS of the control group were significantly lower than the FS of the group diagnosed with anorexia and bulimia. In the self-consciousness facet (N4), the factorial scores were significantly higher in the control group than the subjects diagnosed with anorexia, bulimia and obesity. In addition, in the immoderation (N5) facet, the group diagnosed with obesity had higher scores than the control group and the group diagnosed with bulimia.

Meanwhile, in the extraversion dimension (Fig. 2), the control group had higher and statistically significant FS in the gregariousness (E2) and activity level (E4) facets than the subjects diagnosed with anorexia and obesity. In the friendliness (E1) and assertiveness (E3) facets, the control group's FS were statistically significant and higher than the FS of the group diagnosed with anorexia, bulimia, and obesity. In the cheerfulness (E6) facet, the group diagnosed with anorexia presented statistically significant and lower scores than the control group. In the emotion-seeking facet (E5), the group diagnosed with obesity had statistically significant and lower scores than the group diagnosed with bulimia.

With regard to the openness to experience dimension (Fig. 3), the emotionality (O3) and liberalism (O6) facets, the FS in the control group were significantly higher than the FS in the group diagnosed with obesity. In addition, the FS of the control group in the adventurousness facet (O4) were statistically significant and higher than the FS of the participants diagnosed with anorexia and those with obesity. In the intellect (O5) facet, the bulimia and obesity groups had significantly lower scores than the control group.

About the agreeableness dimension (Fig. 4), the FS of the trust facet (A1), of the control group were higher than the FS of the group diagnosed with anorexia. In the morality (A2) facet, of the group diagnosed with bulimia had significantly lower scores than the control group. In the altruism facet (A3), the FS of the group diagnosed with obesity had significantly lower scores than the control group. In the sympathy (A6) facet, the patients with obesity had lower scores than the control group.

As for the conscientiousness (Fig. 5) dimension, the self-efficacy (C1) facet, the FS of the group diagnosed with obesity facet were significantly lower than the control group. In the dutifulness (C3) facet, the FS of the control group were higher than the FS of the group diagnosed with bulimia.

Discussion

The purpose of this investigation was to examine the personality characteristics among subjects with anorexia, bulimia, obesity, and a control group. The analyses replicate certain findings in the literature and show differences with other

Table 3 Summary statistics for the analysis of variance for personality facet and control group, anorexia, bulimia and obesity

	Control group ($n=68$)	Anorexia ($n=23$)	Bulimia ($n=32$)	Obesity ($n=16$)	F	p	η^2
Neuroticism							
N1 (0.82)	−0.35 ± 0.10	0.55 ± 0.23	0.36 ± 0.17	−0.15 ± 0.28	7.25	< 0.01	0.14
N2 (0.90)	−0.28 ± 0.10	0.26 ± 0.22	0.35 ± 0.18	0.01 ± 0.31	3.79	0.01	0.08
N3 (0.91)	−0.53 ± 0.08	0.59 ± 0.22	0.48 ± 0.18	0.10 ± 0.31	14.54	< 0.01	0.24
N4 (0.76)	0.47 ± 0.09	−0.69 ± 0.26	−0.16 ± 0.15	−0.65 ± 0.30	13.13	< 0.01	0.23
N5 (0.72)	−0.18 ± 0.10	0.11 ± 0.22	−0.21 ± 0.16	0.70 ± 0.32	4.36	0.01	0.09
N6 (0.83)	0.45 ± 0.08	0.61 ± 0.25	0.36 ± 0.20	0.19 ± 0.28	10.02	< 0.01	0.18
Extraversion							
E1 (0.83)	0.44 ± 0.09	−0.70 ± 0.27	−0.22 ± 0.15	−0.51 ± 0.31	11.55	< 0.01	0.20
E2 (0.88)	0.34 ± 0.10	−0.66 ± 0.28	0.01 ± 0.15	−0.43 ± 0.26	7.49	< 0.01	0.14
E3 (0.78)	0.43 ± 0.12	−0.72 ± 0.21	−0.21 ± 0.15	−0.44 ± 0.25	10.72	< 0.01	0.19
E4 (0.75)	0.24 ± 0.10	−0.35 ± 0.26	−0.10 ± 0.18	−0.56 ± 0.28	4.05	0.01	0.08
E5 (0.79)	0.04 ± 0.11	−0.23 ± 0.21	0.25 ± 0.18	−0.61 ± 0.27	3.31	0.02	0.07
E6 (0.87)	0.29 ± 0.09	−0.41 ± 0.28	−0.19 ± 0.18	−0.29 ± 0.30	4.30	0.01	0.09
Openness to experience							
O1 (0.81)	0.10 ± 0.12	0.02 ± 0.22	−0.12 ± 0.18	−0.48 ± 0.21	1.61	0.19	0.03
O2 (0.84)	0.10 ± 0.11	0.22 ± 0.19	−0.18 ± 0.17	−0.44 ± 0.32	2.04	0.11	0.04
O3 (0.77)	0.29 ± 0.11	−0.24 ± 0.23	−0.19 ± 0.15	−0.84 ± 0.28	7.05	< 0.01	0.14
O4 (0.81)	0.23 ± 0.11	−0.44 ± 0.25	0.05 ± 0.15	−0.56 ± 0.26	4.72	< 0.01	0.10
O5 (0.80)	0.27 ± 0.11	−0.19 ± 0.25	−0.31 ± 0.14	−0.64 ± 0.21	5.85	< 0.01	0.12
O6 (0.80)	0.26 ± 0.12	−0.07 ± 0.24	−0.24 ± 0.15	−0.84 ± 0.15	6.82	< 0.01	0.13
A1 (0.81)	0.30 ± 0.11	−0.47 ± 0.27	−0.12 ± 0.14	−0.27 ± 0.28	4.47	< 0.01	0.09
A2 (0.83)	0.23 ± 0.11	0.13 ± 0.21	−0.40 ± 0.19	−0.15 ± 0.24	3.29	0.02	0.07
A3 (0.86)	0.26 ± 0.10	0.03 ± 0.23	−0.18 ± 0.17	−0.67 ± 0.30	4.66	< 0.01	0.09
A4 (0.81)	0.25 ± 0.12	−0.07 ± 0.20	−0.33 ± 0.17	−0.24 ± 0.29	2.92	0.04	0.06
A5 (0.71)	0.17 ± 0.13	0.19 ± 0.25	−0.27 ± 0.16	−0.10 ± 0.23	1.60	0.19	0.03
A6 (0.76)	0.26 ± 0.11	−0.07 ± 0.26	−0.16 ± 0.18	−0.62 ± 0.25	3.83	0.01	0.08
Conscientiousness							
C1 (0.72)	0.26 ± 0.11	−0.06 ± 0.26	−0.18 ± 0.18	−0.64 ± 0.25	4.03	0.01	0.08
C2 (0.89)	0.08 ± 0.12	0.17 ± 0.26	−0.15 ± 0.14	−0.10 ± 0.26	0.65	0.59	0.01
C3 (0.81)	0.26 ± 0.11	−0.14 ± 0.22	−0.37 ± 0.18	−0.15 ± 0.26	3.49	0.02	0.07
C4 (0.78)	0.18 ± 0.11	−0.28 ± 0.23	−0.28 ± 0.18	−0.04 ± 0.26	2.22	0.09	0.05
C5 (0.85)	0.25 ± 0.11	−0.28 ± 0.24	−0.22 ± 0.18	−0.14 ± 0.28	2.68	0.05	0.06
C6 (0.83)	0.17 ± 0.12	−0.05 ± 0.25	−0.18 ± 0.15	−0.11 ± 0.30	1.01	0.39	0.02

The parenthesis contains the reliability values of factorial scores

Significant at the $p < 0.05$ level

N1 anxiety, *N2* anger, *N3* depression, *N4* self-consciousness, *N5* immoderation, *N6* vulnerability, *E1* friendliness, *E2* gregariousness, *E3* assertiveness, *E4* activity level, *E5* excitement-seeking, *E6* cheerfulness, *O1* imagination, *O2* artistic interests, *O3* emotionality, *O4* adventurousness, *O5* intellect, *O6* liberalism, *A1* trust, *A2* morality, *A3* Altruism, *A4* cooperation, *A5* modesty, *A6* sympathy, *C1* self-efficacy, *C2* orderliness, *C3* dutifulness, *C4* achievement striving, *C5* self-discipline, *C6* cautiousness

studies. First, in the present study, the subjects diagnosed with anorexia, in comparison to the control group, showed high and significant scores in neuroticism (anxiety, anger, depression, immoderation, and vulnerability) and low scores on agreeableness, conscientiousness, and extraversion. These results were consistent with the research that suggests that, at the trait level, anorexia is related to a higher score on neuroticism and low scores on extraversion and agreeableness [29, 30]. At the facet level, we found similar results to those posited by Ellickson-Larew et al. [31], who reported positive correlations among anxiety, hostility, depression and vulnerability of the neuroticism trait and anorexia. In addition, results found at the facet level were similar to those by MacLaren and Best [13], who reported low scores on the extraversion facets of assertiveness and positive emotions.

The second main finding of the present study was that subjects diagnosed with bulimia, in comparison to the control group, had higher and significant scores on neuroticism

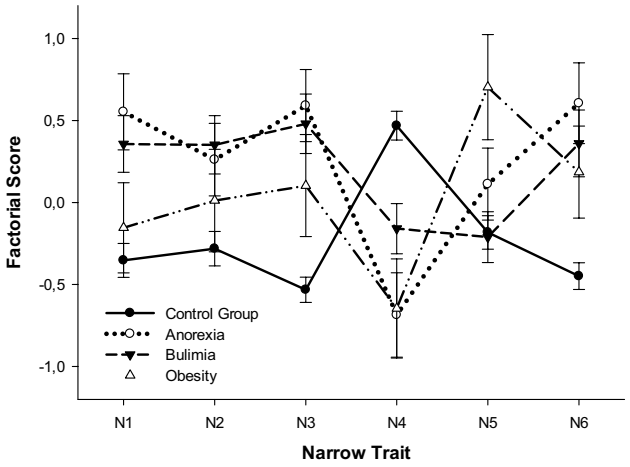


Fig. 1 Factorial scores of the neuroticism dimension with patients diagnosed with anorexia, bulimia, obesity, and the control group. Vertical bars indicate the standard error of the mean. *N1* anxiety, *N2* anger, *N3* depression, *N4* self-consciousness, *N5* immoderation, *N6* vulnerability

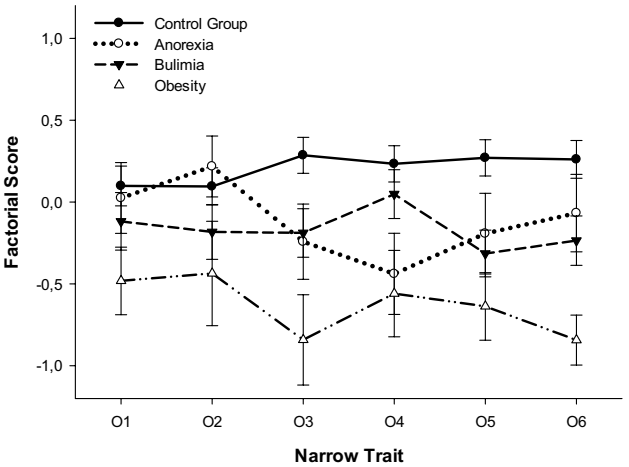


Fig. 3 Factorial scores of the openness to experience dimension with patients diagnosed with anorexia, bulimia, obesity, and the control group. Vertical bars indicate the standard error of the mean. *O1* imagination, *O2* artistic interests, *O3* emotionality, *O4* adventurousness; *O5* intellect, *O6* liberalism

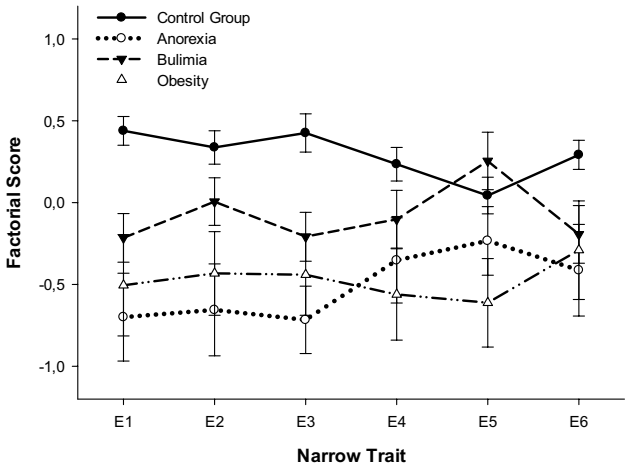


Fig. 2 Factorial scores of the extroversion dimension with patients diagnosed with anorexia, bulimia, obesity, and the control group. Vertical bars indicate the standard error of the mean. *E1* friendliness, *E2* gregariousness, *E3* assertiveness, *E4* activity level, *E5* excitement-seeking, *E6* cheerfulness

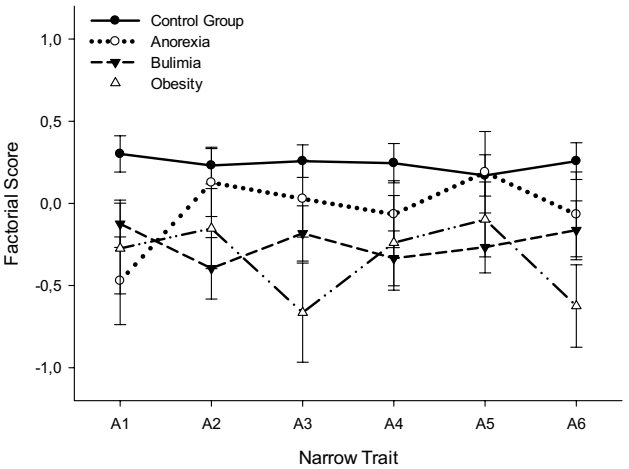


Fig. 4 Factorial scores of the agreeableness dimension with patients diagnosed with anorexia, bulimia, obesity and the control group. Vertical bars indicate the standard error of the mean. *A1* trust, *A2* morality, *A3* altruism, *A4* cooperation, *A5* modesty, *A6* sympathy

(anxiety, anger, depression and vulnerability), and had low and significant scores on extraversion (friendliness, assertiveness), agreeableness (morality) and conscientiousness (dutifulness), which was coincident with data by MacLaren and Best [13]. At the facet level in this study, the result obtained about the relationship between the conscientiousness factor and bulimia were different than those found by Ellickson-Larew et al. [31], who reported that low conscientiousness is related with an eating disorder because it may predict a tendency to eat in response to emotional or environmental cues.

The third main finding was that the patients with obesity in comparison to the control group presented high and significant scores on neuroticism (anxiety, anger, depression, and immoderation) and low and significant scores on agreeableness, extraversion, conscientiousness, and openness to experience. These results were consistent with the previous research, which reported that low levels of extraversion and conscientiousness, and a high level on neuroticism were associated with a high probability for developing obesity [16, 17]. Furthermore, in the present study, there were no statistically significant differences in the excitement-seeking facet between the group of patients diagnosed with obesity

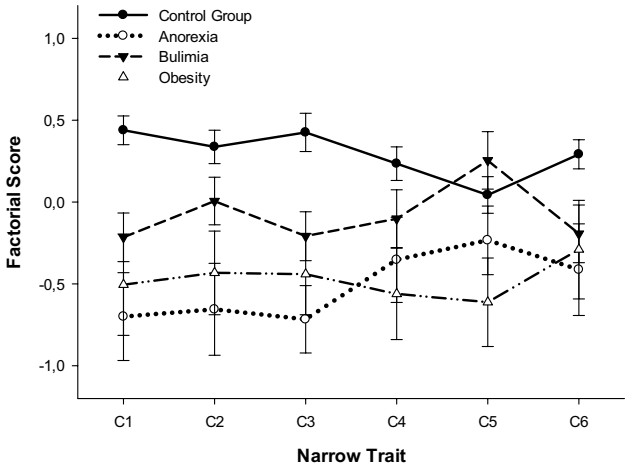


Fig. 5 Factorial scores of the conscientiousness dimension with patients diagnosed with anorexia, bulimia, obesity, and the control group. Vertical bars indicate the standard error of the mean. *C1* self-efficacy, *C2* orderliness, *C3* dutifulness, *C4* achievement striving, *C5* self-discipline, *C6* and cautiousness

and the control group. Results differ from prior research proposing that excitement seeking was found to be associated with weight gain [32]. Similarly, in samples from the US, European countries and the one of the present study, the conscientiousness facet is related with obesity while studies in Asia (i.e., Japan, China, and Korea) suggest that the conscientiousness facet is not related to obesity [31, 33]. In these cases, the different associations between personality and obesity may be the result of the interaction of personality and culture.

Limitations

It is worth mentioning that there are methodological limitations that need to be considered to interpret the results. First, participants of the control group were mostly university students sampled by an incidental procedure. Therefore, the generalizability of the results reported here is limited. However, the diagnosed and control group samples were comparable in size and composition to other research studies in this area. Second, the administration of the questionnaires was carried out in different health centers where the treatments and stages of the patients differed broadly. This may have directly influenced the participants' answers to the questionnaires. Third, there was no longitudinal design and no follow-up measurement. The cross-sectional design of this study does not allow for conclusions to be drawn on causal relationships between self-reported personality factors and changes referred to progress on levels in treatment for bulimia, obesity or anorexia.

Future research

Given the importance of the topic addressed, it is necessary that future research conduct prospective longitudinal studies with large sample sizes that will allow identifying the personality factors predisposing and involved in the onset of EDs and obesity. In addition, epidemiological studies should be conducted on the general population to estimate the prevalence and persistence as well as the treatment these diseases receive in our local population. The impact of personality on the success or failure of clinical treatments for the population clinically diagnosed with only these disorders should also be assessed.

Conclusion

The results obtained from this study support previous research devoted to the study of eating disorders and obesity. This situation favors the valid and relevant nature of the study of personality traits as factors that contribute to explaining behavior disorders associated with eating pathologies. From a cross-cultural sample of subjects diagnosed with bulimia, anorexia, and obesity, the facets of personality more associated to each pathological eating pattern were obtained. This is a preliminary and necessary step for future research to examine the risky combination of personality traits and anorexia, bulimia, and obesity in the local context using a larger and more generalized sample.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent An informed consent was obtained from every participants included in the study.

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