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ORIGINAL ARTICLE

Personality prototype as a risk factor for eating disorders

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Objective: To establish whether the risk of suffering from an eating disorder (ED) is associated with the high-functioning, undercontrolled, or overcontrolled personality prototype groups.
Method: The Revised NEO Personality Inventory (NEO-PI-R) and the Eating Disorder Inventory 2 (EDI-2) were administered to 69 patients diagnosed as suffering from EDs (cases) and 89 people free of any ED symptoms (control group). A cluster analysis was carried out to divide the participants into three groups based on their scores in the Big Five personality dimensions. A logistic regression model was then created.
Results: Participants in the undercontrolled group had a risk of suffering from an ED 6.517 times higher than those in the high-functioning group ($p = 0.019$; odds ratio [OR] = 6.517), while those in the overcontrolled subgroup had a risk of ED 15.972 times higher than those in the high-functioning group.
Conclusions: Two personality subtypes were identified in which the risk of EDs was six times higher (the undercontrolled group) and almost 16 times higher (the overcontrolled group). Prevention and treatment programs for ED could benefit from focusing on the abovementioned personality profiles.

Keywords: Personality disorders; eating disorders; diagnosis and classification; tests/interviews; psychometric properties

Introduction

Eating disorders (EDs) currently constitute one of the most serious mental health problems in Western society.[1] Mortality rates among women suffering from EDs in general and from anorexia nervosa (AN) in particular are higher than for any other psychological disorder. For example, the suicide rate for women with AN is 12 times higher than the rate for women of the same age not suffering from AN.[2] Furthermore, not only do EDs affect sufferers' physical health, but they can also seriously damage psychosocial functioning.[3] Over the last 30 years, gradual progress has been made in our understanding of how EDs can be prevented and treated; however, the origins of this type of disorder are still unclear.[4] The treatments applied have had mixed results, with symptoms persisting unabated in some patients.[5]

The causes of the disorder can certainly be found at least partially in social factors.[6] The incidence rate of EDs is much higher in Western society,[7] especially among young women and adolescent girls,[8] but the fact remains that not all Western adolescent females develop an ED despite their apparent exposure to the same social pressures. Other factors, both genetic and personality-based, must therefore also be involved in the generation of such disorders.[9]

With regard to the results obtained using different forms of treatment, some patients react favorably to conventional therapies focusing on eating habits, whereas others with certain personality traits do not respond to such treatment. In the latter case, it is important to monitor those personality traits to enable administration of a parallel course of treatment.[10]

Better results are obtained by prevention programs carried out with high-risk populations. Thus, also in this area, it is of interest to use risk models based on personality variables, including the features that have been proven to be precursors of such disorders.[11]

As a result, the last few years have seen a flurry of research into the personality profiles of ED sufferers. The work carried out can be divided into studies that have taken a dimensional approach (examining specific dimensions or conducting more general personality evaluations) and those which have taken a categorical approach (relating EDs to personality disorders). One way of combining these two approaches has been to focus on personality prototypes.

A considerable amount of research has been carried out in this field, and the results obtained would appear to indicate the existence of three personality prototypes that are repeatable in different populations and stages of evolution. The studies conducted have employed different instruments and their samples have included both community groups and ED sufferers.[12-20]

The three personality subtypes mentioned above have to do with the amount of control exercised over impulses and emotions. Two of the groups reflect little ability to adapt to changes in the social environment. In one of them, the undercontrolled group, this is manifest in very little control or modulation of impulses, and in the other, the overcontrolled group, it takes the form of excessive control and a certain degree of social avoidance. In contrast, the high-functioning group represents a more balanced personality, with greater ability to adapt to changes in the social environment.[21] In

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community samples, the high-functioning group has generally been associated with a lower risk of psychopathology, the overcontrolled group with a higher risk of internalizing disorders, and the undercontrolled group with a higher risk of externalizing disorders.[17]

This classification was also established using the Big Five model.[17] Asendorpf,[12] for example, defines people with below-average scores in neuroticism and above-average scores in all other dimensions as belonging to the high-functioning group. Those with high scores in neuroticism and low scores in agreeableness and conscientiousness are classified as undercontrolled, while those in the overcontrolled group score high in neuroticism and low in extraversion and openness to experience. Asendorpf found that these three subtypes were the only types that were repeatable in different samples and reliable over time, with different age groups and with different measuring instruments. The same three personality profiles were also obtained by Claes et al.[22] when a cluster analysis was carried out on a sample group of ED sufferers.

There are, however, some exceptions to this three-way model. Krug et al.,[23] using the Temperament and Character Inventory - Revised (TCI-R) as the instrument of evaluation, found that the best-fitting model was a six-profile solution, while another recent study divided patients into four groups: the three mentioned above plus another characterized mainly by negative affectivity and a restrictive diet.[24]

Nevertheless, most researchers continue to defend a model based on three groups, and the use of the three personality prototypes has been vindicated in other recent studies carried out with different ED populations. For example, the same three groups (high-functioning, overcontrolled, and undercontrolled) were identified in three ED studies carried out with adolescents.[16,19,25] Another study used a cluster analysis to separate different profiles in a group of male ED sufferers and, once again, ultimately divided the sample into three groups.[14] The same classification was repeated in two other studies: one carried out with patients diagnosed as having AN[26] and one carried out with a population of subclinical ED sufferers.[27]

In addition, a number of prospective longitudinal studies have shown that the traits associated with the undercontrolled subtype increase the risk of ED,[28,29] while other studies with recovered patients have observed earlier obsessive-compulsive and avoidant personality disorders in patients who later developed EDs.[30] Nevertheless, none of the studies we consulted has investigated the joint capacity of the undercontrolled and overcontrolled groups, taken in comparison with the high-functioning group, to predict EDs. Those studies which have analyzed all three subtypes together have applied them exclusively to either ED or community samples, but have not compared case and control groups.

Our objective in this study, therefore, is to determine how different personality prototypes (high-functioning, overcontrolled, and undercontrolled) affect an individual's risk of suffering from an ED. The starting hypothesis is that people with an overcontrolled or undercontrolled personality profile would have a greater risk of ED than those who belong to the high-functioning group. To test this hypothesis, we conducted a study involving people diagnosed with ED (cases) and people free from ED symptoms (controls).

Material and methods

Participants

A sample group of 70 cases and 91 controls was calculated, based on the number of subjects needed to obtain significant differences in odds ratios (OR) higher than 3, with $\alpha = 0.05$ and a power of 90%. In view of the possible need to discard wrongly diagnosed cases and/or controls vulnerable to EDs and assume the subsequent reduction in size of the sample group, the initial sample size was increased by approximately 50%. The psychometric protocol (described in the Instruments section) was therefore finally applied to a group made up of 106 cases, all of whom had been diagnosed as suffering from EDs by clinical psychologists or psychiatrists. Given the high number of non-specified EDs and frequent changes in diagnosis from one ED subtype to another, we chose not to categorize subtypes by symptoms. Most participants in the case group were women with a university-level education and a mean age of 23 years. Twenty-eight of them had also been diagnosed with depression, 17 with anxiety, eight with substance abuse, and 27 with personality disorders (14 with borderline personality disorder, three with histrionic personality disorder, and nine with non-specified personality disorders). Ninety-six of the patients were taking antidepressants, 18 were taking anticonvulsants, and 14 were taking anxiolytic medication. Simultaneously, the same protocol was administered to 141 university students in the control group. The incidence of psychopathological disorders and/or pharmacological treatment in the control group was not studied, although, on the basis of the findings of earlier studies carried out with the same population,[31] it was assumed to be lower than in the case group. All participants were notified beforehand of the research being carried out and asked to provide consent for inclusion in the study.

Some earlier studies used a clinical interview as the basis for diagnosis, whereas others used questionnaires. We chose to use both methods, so as to obtain more reliable diagnoses in the case group and ensure that no ED sufferers were included in the control group. Patients diagnosed with ED but with low scores (below the 80th percentile) on the EDI-2 symptoms scales (drive for thinness, bulimia, and body dissatisfaction) were eliminated from the case group to ensure that people who may have been diagnosed erroneously would not be included as ED sufferers. Likewise, people with high scores (above the 80th percentile) on those same symptom scales were eliminated from the control group, to reduce the possibility of including non-diagnosed ED sufferers.

With regard to missing data, in no variable did this exceed the 10% cutoff point suggested by Bennett[32] as the minimum for considering the possibility of biased results. We chose not to impute these data, but rather to exclude it from analysis. The definitive case group therefore comprised 65 women and four men, with a mean age of 21.39 years, and the control group comprised 80 women and nine men free from ED symptoms, with a mean age of 21.47 years. Thus, no significant differences existed between the two groups with regard to age ($t = -0.088$, $p = 0.930$) or sex ($p = 0.566$, Fisher's exact test).

Instruments

Revised NEO Personality Inventory (NEO-PI-R)

This instrument provides a measure of the Big Five personality dimensions (neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness)[33-36] and of 30 more specific traits. Only the Big Five results were used for the present study. Regarding reliability, the internal consistency of the factors had Cronbach's alpha values ranging from 0.82 to 0.90.[37]

Eating Disorder Inventory 2 (EDI-2)[38]

This test was created by Garner to evaluate characteristics associated with EDs. It can be applied individually or collectively to subjects from the age of 11, and scales in Spanish have been created both for groups with pathologies and for non-clinical groups. The original instrument, created in 1983, included three scales evaluating attitudes and behavior related to food, weight, and figure (drive for thinness, bulimia, and body dissatisfaction) as well as five more general scales covering physiological features. EDI-2 includes three additional scales, although in the present study we used only those three scales which evaluate eating symptoms. The instrument's internal consistency (Cronbach's alpha) ranges from 0.65 to 0.93 for non-clinical samples and from 0.80 to 0.93 for clinical samples. All scales have a 3-week test-retest reliability coefficient of 0.81 to 0.97.[38]

Procedure

Patients suspected of suffering from EDs were examined at different mental health units, where psychiatrists and clinical psychologists conducted clinical interviews to confirm the diagnoses. The psychometric protocol was then applied to the patients, as well as to a group of university students with a similar sex and age distribution. These controls were voluntarily recruited at the University of Cordoba, Spain. The tests were corrected and the sample group for the study was established as described in the Participants section above. The results obtained were used to create a database which was then statistically analyzed in SPSS version 20.0.

Data analysis

First, a cluster analysis was carried out to group subjects together according to their similarities across different dimensions. Individuals in each of the created groups were thus as similar as possible in terms of those dimensions, while at the same time being different from the members of the other groups. The best cluster is that which minimizes distances between members of the same group in the chosen dimensions while maximizing distances between the centers of the different groups.[39]

Two main cluster analysis strategies can be distinguished: hierarchical clustering and the k-means method. Hierarchical clustering is used when the ideal number of groups is not known, because it provides different clustering alternatives. This method clusters the closest subjects, and the resulting groups gradually join together with each other. Solutions obtained using this method are not perfect, because the subjects clustered at the beginning remain together right through to the end. The k-means method provides more appropriate solutions, but the number of groups into which the sample is to be divided must be known a priori. The initial group centers are either chosen by the researcher or selected by the program as outermost points. From then on, the elements closest to each center are clustered. A new center is then chosen within each cluster as the one most suited to that particular subgroup, and this center then becomes the hub around which the nearest elements undergo a new clustering process. This process continues until no difference exists between centers chosen in consecutive steps.[39] To use the k-means method in our study, a three-group division was chosen, for theoretical reasons. As mentioned in the introduction, this is the model that most researchers have considered the most repeatable across different sample groups and different instruments, in both ED and community groups.[12,14-16,18,40-42] As noted above, the k-means method produces the best results if the number of groups to be used is known.

Once the subjects had been divided into three groups, a new logistic regression analysis was carried out, this time taking personality prototype group (high-functioning, overcontrolled, or undercontrolled) as the independent variable and ED vs. control group status as the dependent variable. This method made it possible to predict the risk of suffering from an ED on the basis of each subject's specific personality profile group.

Results

Cluster analysis

In cluster analyses, it is advisable to work with typical scores, so the first task was to typify the scores obtained. Table 1 shows the results of k-means analysis for the three groups. Cluster 1 was characterized by higher-than-average scores

Table 1 Final cluster centers

	Cluster 1 Undercontrolled	Cluster 2 Overcontrolled	Cluster 3 High-functioning
Neuroticism	0.18366	0.35939	-1.58158
Extraversion	0.81789	-0.69118	0.84001
Openness to experience	0.74612	-0.58387	0.60581
Agreeableness	-0.51415	0.11933	0.55611
Conscientiousness	-0.07513	-0.36414	1.39390

Table 2 Analysis of variance (ANOVA) of cluster centers with the Big Five

	F	p-value
Neuroticism	71.298	< 0.001
Extraversion	104.555	< 0.001
Openness to experience	54.264	< 0.001
Agreeableness	12.218	< 0.001
Conscientiousness	48.253	< 0.001

in neuroticism, extraversion, and openness to experience, and lower-than-average scores in agreeableness and conscientiousness. High scores in neuroticism and low scores in agreeableness and conscientiousness would correspond to the personality profile known as the undercontrolled group.[12] Cluster 2 was characterized by higher-than-average scores in neuroticism and agreeableness and lower-than-average scores in extraversion, openness to experience, and conscientiousness. High scores in neuroticism and low scores in extraversion and openness to experience are found in the overcontrolled group.[12] Cluster 3 was characterized by lower-than-average scores in neuroticism and higher-than-average scores in the other variables, which Asendorpf[12] associated with the high-functioning subtype.

Table 2 shows the results of analysis of variance (ANOVA), which revealed significant differences between the three clusters in the five personality dimensions.

Logistic regression analysis

Table 3 shows the significance and OR of the undercontrolled and overcontrolled groups in comparison with the high-functioning group. The risk of ED was 6.517 times greater in the undercontrolled group (p = 0.019; OR = 6.517) than in the high-functioning group, while individuals in the overcontrolled group were 15.972 times more likely to develop EDs than those in the high-functioning group.

Discussion

In general, the cluster analysis data for the model obtained in our study was consistent with the three-way classifications obtained in other studies.[12,22] Our cluster 1 would correspond to the undercontrolled group, with the two characteristics that Asendorpf[12] considered most repeatable in different samples and using different instruments: low levels of agreeableness and conscientiousness. These characteristics were also found by Claes et al.[22] in ED sample groups. Cluster 2 would correspond to the three characteristics of what Asendorpf[12] called the overcontrolled group: high neuroticism and low extraversion and openness to experience. Again, these same characteristics were found by Claes[22] in ED samples. Finally, cluster 3 exhibited below-average scores for neuroticism and above-average scores for the other variables, as in the Asendorpf[12] and Claes[22] descriptions of the high-functioning personality subtype.

Table 3 Odds ratio (OR) according to cluster membership

	Coefficient	p-value	OR (95%CI)
High-functioning	1	< 0.001	1
Undercontrolled	1.874	0.019	6.517 (1.366-31.093)
Overcontrolled	2.771	< 0.001	15.972 (3.539-72.091)

95%CI = 95% confidence interval; OR = odds ratio.

In the introduction, we mentioned some studies which have provided evidence that people with personality traits associated with the undercontrolled subtype are at higher risk of EDs,[28] and other investigations, carried out with recovered patients, in which obsessive-compulsive and avoidant personality disorders were observed among patients suffering from EDs.[30] This information led us to think that, although different studies into personality subtypes in EDs had found three personality profiles in their clinical sample groups, the profiles which actually do indicate ED risk were more likely to be the undercontrolled and overcontrolled subtypes. However, no research had hitherto been carried out to investigate the predictive capacity of these two personality subtypes in comparison with the high-functioning subtype with regard to ED development. The results of our study corroborated our hypothesis, revealing that the odds of suffering from an ED is significantly higher (more than sixfold) among people with an undercontrolled personality profile, and even higher (almost 16 times) among people with an overcontrolled profile.

In terms of the limitations of this study, in our opinion, a prospective longitudinal study is needed to verify the causal directions inferred herein and thus confirm whether these two personality profiles really do increase future risk of ED development.

Regarding implications of this study for clinical practice and future research, we consider that the personality subtypes identified have potential implications of great interest for ED diagnosis, prevention, and treatment. In the field of diagnosis, earlier research - which had only studied personality subtypes in ED populations - identified a high-functioning subgroup, but with lower scores both for general psychopathology and for ED symptoms.[15] One possible explanation is that some of the cases included in these studies may not really have had ED, but rather merely displayed subthreshold symptoms. It should be taken into account that ours is the only published study to employ a double classification system to ensure both the accuracy of ED diagnoses in the case group and the absence of ED symptoms in the control group. We recommend combining self-report instruments with clinical interviews to increase diagnostic reliability both in clinical work and in the research stage.

With regard to prevention, our model allows early detection of people at high risk of developing EDs. It also makes it possible to address those personality traits that have been shown to anticipate ED as part of future action programs.[11]

With regard to treatment, some earlier studies have already suggested the importance of identifying certain personality variables (perfectionism and emotion-focused coping strategies) when establishing what treatment should be administered.[43] Cognitive behavioral therapies focusing on ED symptoms do not address the emotional

and relational traits associated with the overcontrolled and undercontrolled personality subtypes, and this may explain why many patients make no progress with such therapies. In our opinion, it would be useful to design programs specifically aimed at helping ED sufferers with those personality profiles. One possible course of treatment, which has already proved its effectiveness, is Linehan's dialectical behavior therapy.[44] This therapy helps patients develop strategies for emotional coping, frustration tolerance, awareness, and effective interpersonal communication. All these skills are related to shortcomings typically found in the overcontrolled and undercontrolled personality subtypes. However, although some studies have been carried out into the overall efficiency of this treatment modality for EDs, it is still unclear whether its impact in these two subtypes is noticeably more beneficial than in the high-functioning subtype. Our hypothesis is that ED patients belonging to the high-functioning group will benefit from standard ED treatment, whereas those belonging to the undercontrolled or overcontrolled subtypes will need to have their standard treatment supplemented by additional therapy specifically designed to overcome their particular difficulties, e.g., dialectical behavior therapy.

In conclusion, two personality subtypes were identified in which the risk of suffering from ED was six times higher (the undercontrolled group) and almost 16 times higher (the overcontrolled group) than in high-functioning subjects. In our opinion, the implementation both of prevention programs and of treatment interventions which specifically address these personality profiles may significantly improve outcomes.

Disclosure

The authors report no conflicts of interest.

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