M. Inda-Caro[1]
S. Lemos-Giráldez[1]
M. Paíno-Piñeiro[1]
J. L. Besteiro-González[1]
J. L. Alonso-Rionda[3]
J. Bobes-García[2]
E. García-Cueto[1]

Dimensions of personality disorders and neurophysiological correlates

[1] Faculty of Psychology
University of Oviedo. Spain
[2] Faculty of Medicine
University of Oviedo. Spain
[3] Mental Health Services
Asturias. Spain

Introduction. To objective is to identify the factorial structure underlying personality disorders, using clinical and personality measures, and to check whether the resulting structure is valid and theoretically comprehensible, using neurocognitive and psychophysiological measures for establishing possible differences between the factors.

Method. From the data obtained with the scales MCMI-II and BFQ administered to a sample of 87 subjects diagnosed as a case of any clinical category of DSM-IV personality disorders, and 17 normal controls, we carried out first-order and second-order factor analyses.

Results. Five first-order factors (designated as aggressive personality, personality with social deficit, non-pathological personality, obsessive personality and non-assertive personality) and three second-order factors (personality with social deficit/non-assertive, aggressive personality, and non-pathological/obsessive personality) were found.

Conclusions. On studying the second-order factors in relation to neurocognitive and psychophysiological measures, it was found that socially-inhibited and non-assertive personalities (factor 1) are characterized by specific neuropsychological deficits in sustained attention; that aggressive personalities (factor 2) are characterized by impulsiveness and deficit in concepts formation; and that in non-pathological personalities with obsessive traits (factor 3), as obsessiveness increases, subjects present less efficacy in sustained attention tasks and greater psychogalvanic response to stress.

Key words:
Personality disorders. MCMI-II. Factor analysis. Neurocognitive functions..

Actas Esp Psiquiatr 2006;34(3):175-184

Dimensiones de los trastornos de la personalidad y correlatos neurofisiológicos

Introducción. El objetivo es identificar la estructura factorial que subyace a los trastornos de la personalidad utilizando medidas clínicas y de la personalidad y comprobar si la estructura resultante es válida o teóricamente comprensible utilizando medidas neurocognitivas y psicofisiológicas para establecer las posibles diferencias existentes entre los factores.

Método. A partir de los datos obtenidos con las escalas MCMI-II y BFQ en una muestra de 87 sujetos diagnosticados de alguna de las categorías clínicas de los trastornos de la personalidad del DSM-IV y 17 controles normales se realizaron análisis factoriales de primero y segundo orden.

Resultados. Se obtuvieron cinco factores de primer orden (denominados personalidad agresiva, personalidad con déficit social, personalidad no patológica, personalidad obsesiva y personalidad no asertiva) y tres factores de segundo orden (personalidad con déficit social/no asertiva, personalidad agresiva y personalidad no patológica/obsesiva).

Conclusiones. En el análisis de la relación existente entre los factores de segundo orden y las medidas neurocognitivas y psicofisiológicas se encontró que las personalidades socialmente inhibidas y no asertivas (factor 1) se caracterizaron por déficit neuropsicológicos específicos en la atención sostenida, que las personalidades agresivas (factor 2) se caracterizaron por la impulsividad y el déficit en la formación de conceptos y que las personalidades no patológicas con rasgos obsesivos (factor 3), presentaban un nivel progresivamente menor de eficacia en tareas de atención sostenida y una mayor respuesta psicogalvánica al estrés a medida que los rasgos de obsesividad aumentaban.

Palabras clave:
Trastornos de la personalidad. MCMI-II. Análisis factorial. Funciones neurocognitivas.

INTRODUCTION

The concept of personality disorder (PD) has been continually modified[1], and conceptual problems increased

Correspondence:
Serafín Lemos-Giráldez
Facultad de Psicología
Universidad de Oviedo
Pl. Feijoo, s/n
33001 Oviedo. Spain
E-mail: slemos@uniovi.es

with DSM Axis II[2], a hybrid of observations derived from clinical work and research, where the ten current categories have been defined using criteria from different areas of functioning, such as cognition, affect, interpersonal relations or the control of impulses, but in their organization there is no underlying specific theoretical orientation nor is there any empirical basis. The result of such weak premises is a taxonomy with important shortcomings; a deficient discriminant validity of the constructs and instruments of assessment and low test-retest reliability of the categories; high comorbidity; an artificial dichotomy of traits of a continuous nature and of criteria, in terms of present-absent; and doubtful internal consistency and construct validity of the three clusters (eccentric, dramatic and anxious)[3-5].

Diverse psycho-biological studies concede certain construct validity to some of the PDs of the DSM, such as antisocial personality, which has been found to be characterized by structural and functional peculiarities in prefrontal areas of the brain, reduction of psychophysiological responses to stress, and deficiencies in the mechanisms of self-regulation of behaviour[6,7]; schizotypal disorder, in which various deficits in frontal executive functions have been identified[8,9]; or borderline disorder, in which some decrease in the bilateral frontal metabolism has been found[10]. Nevertheless, the majority of studies call into question the validity of both the DSM categories and clusters[11].

As an alternative to the categorial definition of PDs, other models have been proposed, based on a set of dimensions for representing maladaptive behaviour, such as that of the big-five factors[12], or that of temperamental and character[13,14], and psychobiological dimensions[15]. Neurocognitive markers, evoked potentials or eye tracking characteristics has also provided indicators of genotypic similarity of schizotypal, schizoid and paranoid PDs.

Bearing in mind the conceptual diversity and dissatisfaction among professionals and researchers with regard to the categorial taxonomies, this study sets out two objectives: *a)* to identify the factorial structure underlying PDs, using clinical and personality measures, and *b)* to check whether the resulting structure is valid and theoretically comprehensible, using neurocognitive and psychophysiological measures for establishing possible differences between the factors.

METHOD

Participants

The sample was made up of 103 people, with a mean age of 31.64 years (SD = 11.05), 41 males (39.8 %) and 62 females (60.2 %). Education level was university in 20.2 %, secondary and professional in 47.1 %, and primary in the remaining 32.7 %. At the time of the assessment, only 27.9 % of the sample were students. Eighty-six were selected, in chronological order, from patients the mental health centres of the Principality of Asturias, and fulfilled the criteria one DSM-IV PD (clinical group) (table 1), while 17 were taken from the general population, with no history of mental disorders (normal group). Exclusion criteria were age under 17 years, substance abuse, psychotic or organically-based cerebral pathology.

Measures

1. For the assessment of the personality dimensions and possible clinical disorders, we used Spanish versions of Millon Clinical Multiaxial Inventory (MCMI-II)[16] and The Big Five Questionnaire (BFQ)[17], an instrument validated with Spanish population and based in the big factors model of personality, suggested by Costa and McCrae[18]. In the case of the clinical group, in addition to administering the tests to each subject, we invited a close relative to respond to the BFQ, with the aim of comparing the two sets of information. The matrix of correlations between the data provided by relatives and subjects did not, however, show significant differences; thus, in subsequent analyses we used the data obtained directly from the participants in the study.

2. We carried out a neuropsychological assessment of prefrontal neurocognitive functions (concepts formation, sustained attention, planning and mental flexibility), as the executive functions play an important role in the con-

Table 1 Clinical sample, according to DSM-IV categories

Personality disorders	n (%)
Cluster A	22 (25.58)
Paranoid	6 (6.98)
Schizoid	10 (11.62)
Schizotypal	6 (6.98)
Cluster B	39 (45.35)
Bordeline	24 (27.90)
Antisocial	2 (2.32)
Histrionic	10 (11.62)
Narcissistic	2 (2.32)
Cluster C	22 (25.58)
Obsessive-compulsive	6 (6.98)
Dependent	10 (11.62)
Avoidant	6 (6.98)
Other (passive-aggressive, not specified)	3 (3.49)
Total sample	86

trol, adaptation and self-regulation of behaviour. The following computerized tasks were self-administered, in the format included in the STIM package (NeuroScan, Inc.): Stroop Test[19], with the presentation of 100 verbal stimuli written in ink of a same or different colour to that which they designate. Stimulus duration was 0.1 s, and inter-stimulus interval was 1 s. The measures obtained were percentage of correct responses and mean reaction time to congruent and incongruent stimuli (colour name and ink coinciding or not), respectively, and number of time-outs; Wisconsin Card Sorting Test (WCST)[20,21], made up of six sets of stimuli or categories in which the classification criterion changed as soon as the figure of 10 correct responses had been reached. Auditory and visual feedback was provided to inform subjects whether the response was correct or incorrect. The program provides three global measures: number of correct responses, number of incorrect responses and number of categories completed; and Continuous Performance Test (CPT)[22], a test of sustained attention based on the presentation of 400 letters, among which the subject must identify as target stimulus the letter «T» when it appears after the letter «P» (lure stimulus). Stimulus duration was 0.05 s, and inter-stimulus interval was 1 s. The measures obtained were number of correct responses (or errors of omission, considering the difference between correct responses and total target stimuli), errors of commission (false alarms); sensitivity (a-prime), which refers to the subject's capacity to discriminate the target stimulus from the rest of the contextual stimuli, and response bias (beta), which indicated a conservative criterion when the value is high and a liberal or impulsive criterion when it is low; and finally, mean reaction time between presentation of each target stimulus and emission of the response.

3. For the psychophysiological assessment we obtained two measures while participants performed two tasks on a computer (one of perceptual discrimination and another arithmetical) of increasing difficulty, generating experimental stress. These measures were: *a)* electrodermal response, by means of the THE-RES CY-750, and *b)* cardiac frequency, by means of Cardioback CY-450. Both instruments belong to the Biosoft biofeedback package, version 5,1 (BioCiber, SL).

Procedure

Subjects were examined individually in two sessions. In the first session, personality tests were administered, and the neuropsychological and psychophysiological assessments were carried out in the second session, in a soundproofed, well-lit laboratory room.

For the clinical group, the psychological assessment was programmed during the first visit as part of the routine attention, while free of pharmacological or psychological treatments. Diagnoses were derived from clinical interviews by experienced psychiatrists, but the diagnostic process was completed with the administration of the IPDE by psychologists. Overall, there were not significant differences between both diagnostic procedures.

RESULTS

For the first objective of this work, a factorial analysis was carried out with the scores in the MCMI-II and BFQ scales. Given that the aim was to check for the possible existence of some basic structure in the personality dimensions, we felt it appropriate to consider the sample as a whole, regardless of the existence or not of the clinical diagnosis of PD. Theoretically, it is assumed that abnormal personalities represent extreme levels of the same traits that make up the normal personality; and previously, we made an analysis in order to reveal possible differences between the two groups in the sociodemographic variables, finding no statistically significant differences, with the exception of the education level ($\chi^2 = 7.354$; $p < 0.05$) that was lower in the PDs group.

The factorial analysis of the personality measures, obtained with the extraction of principal factors method with oblimin direct rotation, revealed a structure of five first-order factors that explained 80.27 % of the total variance, and termed aggressive personality, personality with social deficit, non-pathological personality, obsessive personality and non-assertive personality. In a second-order factor analysis, with the aim of fitting the previous dimensions to a three-factor solution (as is the case of the taxonomy of the DSM and in other research), we obtained three dimensions: personality with social deficit and non-assertive personality (factor 1); aggressive personality (factor 2); and non-pathological personality and obsessive personality (factor 3), that explained 70.52% of the total variance (table 2). This three-factor solution shows characteristics far removed from those of the three clusters of the DSM, with factor 1 (which includes schizoid and schizotypal personalities) being perhaps the closest to DSM cluster A.

With the aim of studying some of the differential characteristics of the three second-order dimensions, which could give construct validity to the factorial solution obtained, each one of the three factors was analyzed with the neurocognitive and psychophysiological measures. Assuming that each one of the personality dimensions obtained may reflect different underlying cognitive, impulsiveness and psychophysiological characteristics, we compared subjects with various levels in the factorial scores.

First of all, we created two groups of subjects in each factor. On the one hand, those whose factorial score was above the mean, and on the other, those with factorial scores below the mean. We used factorial scores rather than raw scores, since this approach takes into account the true

Table 2 Factorial structure obtained using the scales of the questionnaires MCMI-II and BFQ: first and second order factors

First-order factors				
Factor 1: agressive personality	**Factor 2: personality with social deficit**	**Factor 3: non-pathological personality**	**Factor 4: obsessive personality**	**Factor 5: non-assertive personality**
Sadistic (0.89)	Schizoid (0.69)	Extraversion (0.87)	Obsessive-compulsive (0.72)	Dependent (0.84)
Antisocial (0.82)	Histrionic (–0.67)	Openness (0.85)	Paranoid (0.50)	Masochistic (0.70)
Paranoid (0.81)	Avoidant (0.66)	Conscientiousness (0.81)	Masochistic (–0.28)	Schizotypal (0.50)
Passive-aggressive (0.79)	Narcissistic (–0.46)	Agreableness (0.73)	Passive-aggressive (–0.24)	Avoidant (0.39)
Narcissistic (0.72)	Scizotypal (0.45)	Emotional stability (0.46)	Bordeline (–0.23)	Bordeline (0.36)
Borderline (0.64)	Extraversion (–0.23)	Narcissistic (0.13)	Avoidant (–0.23)	Emotional stability (–0.23)
Dependient (–0.33)	Masochistic (0.21)		Dependent (0.19)	Agreeableness (0.20)
Schizoid (0.33)	Conscientiousness (0.17)		Emotional stability (0.17)	Histrionic (0.16)
Avoidant (0.32)	Obsessive-compulsive (0.17)		Antisocial (–0.17)	Sadistic (–0.16)
Histrionic (0.31)	Passive-aggressive (0.10)		Conscientiousness (0.16)	Obsessive-compulsive (0.11)
Emotional stability (–0.31)	Borderline (0.11)		Histrionic (–0.16)	
Masochistic (0.30)			Openness (–0.14)	
Agreeableness (–0.19)			Narcissistic (0.11)	
Extraversion (0.14)				
Openness (0.12)				
Second-order factors				
Factor 1		**Factor 2**		**Factor 3**
Personality with social deficit (0.56) Non-assertive personality (0.53)		Aggressive personality (0.39) Obsessive personality (–0.43)		Non-pathological personality (0.43) Obsessive personality (0.30)

eigenvalues of each variable in each factor, obtaining a more coherent value for each subject and/or group at the level of each variable studied.

Next, we compared the neuropsychological and psychophysiological variables between these groups, using the non-parametric Mann-Whitney U test (table 3). In factor 1 (personality with social deficit and/or non-assertive personality), we found no statistically significant differences between the groups. In factor 2 (aggressive personality), we found differences in the number of time-outs in the Stroop Test (which may be expressing low impulsiveness in the less aggressive subjects), and in the sensitivity measure of the sustained attention test (CPT) (that is, greater overall efficacy in the task in non-aggressive subjects). With regard to factor 3, corresponding to non-pathological and/or obsessive personality, we found differences in the two measures of the CPT: number of correct responses and sensitivity index (that is, better performance in those who score lower in this factor and are less obsessive); and in electrodermal response (lower resistance or higher conductance in those who score higher and are more obsessive).

In third place, for a further and more detailed analysis we divided the subjects into three levels in each of the second-order factors: those whose factorial score was below percentile 25, those situated in the central 50 %, and those who scored above percentile 75. We compared these three groups of each factor with the same independent variables. For this analysis we chose the Kruskal-Wallis test (table 4). With regard to factor 1 (non-assertive personalities and with social deficit), we found differences in errors of commission in the CPT (subjects situated at the medium level of the social deficit factor being those that committed most errors), though the *post hoc* Gibbons test[23] revealed no statistically significant differences. The largest differences were observed between the subjects of the low-level group (below percentile 25) and the medium group, and between this central group and those at the high level (above percentile 75). In the sensitivity measure, significant differences were also found between the groups, with better performance the lower the score in the factor; that is, greater efficacy in task performance the lower the social deficit. In the pairwise comparison we found differences close to statistical significance between those of low level (below percentile 25) and

Table 3 Validation of the second-order factors comparing, from a dichotomic perspective, subjects whose factorial score is below and above the mean: measures for which statistically significant differences were found

Variables	Groups	Means	Significance
Factor 2: aggressive personality			
Stroop: time outs	Low	13.09	$p = 0.06$
	High	8.28	
CPT: sensitivity (a-prime)	Low	0.9789	$p \leq 0.05$
	High	0.9711	
Factor 3: non-pathological and/or obsessive personality			
CPT: No. of correct responses	Low	14.61	$p = 0.01$
	High	14.45	
CPT: sensitivity (a-prime)	Low	0.9777	$p < 0.001$
	High	0.9699	
Skin resistance response	Low	−0.23	$p < 0.05$
	High	−0.11	

the central group, and between the groups at the two extremes.

As regards the second factor, aggressive personalities, we found significant differences in the number of time-outs in the Stroop test, indicating that the greater the aggressiveness, the fewer the time-outs; that is, the more aggressive the subjects, the quicker and more impulsive they were found to be in their responses. The differences were also significant in the pairwise comparison, so that this was a markedly progressive characteristic according to the level of aggressiveness. The response bias of the CPT also revealed a conservative style in subjects with low aggressiveness and a more liberal criterion in those from the medium level. Despite the fact that the *post hoc* Gibbons test did not indicate statistically significant differences among levels, it can nevertheless be observed that the medium group (central 50 %) differed from the subjects of the extreme groups. The groups also differed in the WCST, with the medium group making more errors than those from the low-level group (below percentile 25) and those from the high-level group (above percentile 75), though the differences did not reach statistical significance in this second comparison.

In factor 3 we found significant differences in the number of correct responses and in the sensitivity measure of the CPT, indicating a higher degree of efficacy in task performance in subjects from the medium level of the factor; thus, those who scored lowest in the normality factor and those who scored highest in that factor and showed obsessive traits were least effective in task performance. Differences resulting from the pairwise comparison among the three groups were also significant. The measure of electrodermal response also revealed differences, with lower resistance or higher conductance in those who scored highest in this factor.

DISCUSSION

The results of the factor analyses of two personality tests have permitted us to obtain five first-order factors in the personality characteristics of the subjects studied and three second-order factors, two of which having clearly abnormal characteristics and one factor with non-pathological traits, although with some obsessive characteristics. Factor 1 is that which bears the closest resemblance to DSM Cluster A; factor 2 is highly saturated in aggressive and antisocial behaviours; and the dimensions of the BFQ but none of the characteristics of abnormal personality, with the exception of obsessive personality, loaded on factor 3.

The neurocognitive and physiological measures used revealed the following differential characteristics in the between-groups analyses of each second-order factor: a specific alteration in sustained attention (commission errors and sensitivity in the CPT) in personalities with social deficit and low assertiveness (factor 1); differences between the intensity levels of factor 2 (aggressive personality) in impulsiveness (in the Stroop Test), conservative-liberal style (in the CPT) and performance in the formation of concepts task (WCST), and differences between the intensity levels of factor 3 (non-pathological and/or obsessive personalities) in attentional efficacy (number of correct responses and sensitivity measure in the CPT) and electrodermal response.

The grouping of the factors underlying the PDs was quite different from those of the DSM. First-order factor 1, called aggressive personality, was similar to that observed in the structure found by Dowson and Berrios[24], with the difference that in the work of these authors and in the DSM, paranoid personality was grouped with the schizoid and schizotypal disorders, whereas in the present research the paranoid disorder moves to the aggressive factor.

Other authors have also identified a factor involving impulsive and sociopathic behaviour[25,27]. Mulder and Joyce[28] obtained four factors, one of which was labelled antisocial, that included the borderline, histrionic, antisocial, narcissistic, passive-aggressive, and paranoid PDs. The second factor, called asocial, included the schizoid PD and may be likened to factor 2 of the present research, la-

Table 4 Validation of the second-order factors comparing three ranges of subjects whose factorial score is below percentile 25, in the central 50 %, and above percentile 75: measures for wich statistically significant differences were found

Variables	Groups	Means	Significance	*Post hoc* comparisons
Factor 1: Personality with social deficit and/or non-assertive personality				
CPT: No. of commission errors	Low	1.51	$p < 0.05$	
	Medium	3.1		
	High	1.55		
CPT: sensitivity (a-prime)	Low	0.9781	$p < 0.05$	
	Medium	0.974		
	High	0.9722		
Factor 2: aggressive personality				
Stroop: time outs	Low	14.75	$p < 0.01$	Low vs high ($p < 0.05$)
	Medium	10.71		Medium vs high ($p < 0.05$)
CPT: response bias (beta)	High	0.67	$p = 0.05$	
	Medium	0.53		
	High	0.62		
WCST: No. of errors	Low	37.37	$p = 0.01$	Low vs medium ($p < 0.05$)
	Medium	50.98		
	High	40.61		
Factor 3: non-pahtological and/or obsessive personality				
CPT: No. of correct responses	Low	14.53	$p < 0.05$	
	Medium	14.61		
	High	14.37		
CPT: sensitivity (a-prime)	Low	0.9771	$p < 0.001$	Low vs high ($p < 0.05$)
	Medium	0.9771		Medium vs high ($p < 0.05$)
	Low	0.9672		
Skin resistance response	Low	–0.23	$p < 0.05$	
	Medium	–0.20		
	High	–0.07		

belled personality with social deficit, since here also the schizoid PD is the one with greatest eigenvalue (0.69), followed by histrionic PD (-0.67). These two disorders could be considered as the two poles of a dimension, being histrionic PD the positive pole (strong presence of social relationships), and schizoid PD the negative pole (absence of social relationships).

Our first-order factor 2, personality with social deficit, was made up of the avoidant, schizotypal and schizoid PDs; a result close to that obtained by Dowson and Berrios[24], as they found a factor made up of the paranoid, schizoid, schizotypal, avoidant, and self-defeating PDs.

Factor 3 was made up of the BFQ scales, in the absence of the abnormal personality scales of the MCMI-II, with the exception of narcissism, which is represented with a relatively low eigenvalue; therefore, this factor was labelled non-pathological personality.

Factor 4 was called obsessive personality, since the obsessive-compulsive PD has the greatest eigenvalue (0.72), followed by paranoid PD (0.50), perhaps due to the persistence of the contents of consciousness such as suspiciousness, preoccupation with details, rigidity and stubbornness, difficulty for forgetting insults or scorn, systematic mistrust, etc., which may also reflect obsessive components. Some of this cognitive-interpersonal criteria for obsessive-compulsive PD are persistent and have shown good longitudinal diagnostic efficiency[29]. Our finding also coincides with Mulder and Joyce's fourth factor called «anankastic»[28], the obsessive-compulsive factor obtained by Parker et al. in a four-factor model[30,31], and the «anankastic» factor also found in a four-factor solution by Tyrer and Alexander[32].

Mulder and Joyce[28] obtained a factor they called «asthenic», representing a dimension that included anxious people, with behaviours of fear and dependence and, at the same time, shy and with a desire to establish social

relationships. That is, this dimension included the avoidant, dependent, self-destructive, and schizotypal PDs. In our study we found a similar factor, which we called non-assertive personality (factor 5), mainly because of the high eigenvalue of the dependent and self-destructive PDs.

On the basis of these five first-order factors, in our study we obtained three second-order personality factors. The first of these grouped together personalities with social deficit and non-assertive personalities. The characteristic common to these two broad groups of disorders was a deficit in interpersonal relationships. The second factor brought together aggressive personalities and non-obsessive personalities, and the common characteristic here was the aggressiveness-impulsiveness component. Finally, the coincidence in a single factor (factor 3) of traits of non-pathological and obsessive personalities may be due to the existence of a certain commonality between the first-order factor non-pathological personality and the characteristics of perfectionism and obsessive persistence; in fact, in first-order factor 3, the trait «conscientiousness» is one of those with greatest eigenvalue (0.81).

Subsequently, we carried out a cluster analysis with the five first-order factors in order to confirm the three-factor solution. Using the hierarchical method, the solution obtained was that a first cluster included the aggressive personalities; in a second cluster, the non-assertive personalities with social deficit (social conflicts); and in a third cluster, the obsessive personalities and the Big-five personality factors.

Previous studies aimed at identifying the most notable basic dimensions of Axis II have concluded that there are three principal dimensions (represented in the DSM as clusters), as well as a fourth factor that included the obsessive-compulsive disorder[25,26], which was difficult to interpret, and even rejected as a methodological artefact. Nevertheless, the results of Wiggins and Pincus[33] show that this fourth factor could be interpreted as the conscientiousness dimension of the Big Five model. This factor appears as the contrast between those disorders that are characterized by organization and self-control (e.g., obsessive-compulsive disorder) and those characterized by a lack of self-discipline (antisocial disorder).

In the second part of the study, we divided up the subjects on the basis of the second-order factors, in order to compare the two interpretations on the nature of PDs: the categorial and the dichotomic (in terms of present or absent) and the dimensional and the continuous (of graded intensity or seriousness). The division of subjects above and below the mean in each factor permits an approximation to the categorial perspective (one has a disorder or one does not) and the identification of possible differences. Considering this two-level distribution, it was observed that in the second-order factor 1, which included disorders with social deficit and non-assertiveness, there were no between-group differences. In the second-order factor 2 it was found that the subjects with aggressive and impulsive traits responded more quickly (with fewer time-outs) and were poorer at discriminating the relevant from the irrelevant information in the sustained attention test, compared to the subjects with scores below the mean in this factor. Between-group comparisons in factor 3 showed that subjects with high levels of perfectionism or obsessiveness scored proportionally fewer hits in the sustained attention test, and had poorer discrimination indices and lower electrodermal response; that is, in a situation of experimental stress they displayed higher skin conductance, which is almost certainly related to greater psychophysiological reactivity.

From this first comparison, it was deduced that the attentional component is that which best discriminates between subjects with high levels in the factors underlying the PDs and those who do not present disorders of this type.

Between-group comparisons, in a more dimensional or continuous approach, at the three levels (low, medium and high intensity in the factorial scores), permitted us to observe that in the second-order factor 1, qualitative changes occur in sustained attention the higher the score in the non-assertive/social deficit personality, in the form of a significant increase in the number of commission errors, as well as in terms of lower efficacy in task performance. The more marked the social deficit, the more the decrease in capacity for discriminating the relevant from the irrelevant stimuli in the perceptual task of sustained attention. This finding, which was masked in the previous, dichotomic division of the sample, could be related to the neurocognitive deficit widely observed in schizotypal and schizoid personalities[34-38].

In the second-order factor 2, it was found that as the tendency to aggressiveness increased there was also expressed a pattern of impulsive behaviour, a risky and liberal response style and a lower degree of efficacy in concepts formation. These findings emerge from the comparison of the subgroups in three measures: number of time outs in the Stroop task, response bias (beta) in the CPT and number of errors in the WCST, respectively. They coincide with the results of previous research (being more intense in antisocial personality) and are attributed to functional anomalies in the frontal cortex[6].

Finally, the comparison of subjects with various levels of intensity in the score in the second-order factor 3 permitted the conclusion that the higher the score, the lower the global efficacy in the sustained attention task (in accordance with the sensitivity or a-prime measure of the CPT) and the lower the electrical skin resistance to experimental stress. Both results appear to be explained by the increase in the anxiety level, which is almost certainly associated with obsessiveness.

Thus, according to the results of the study, the factorial structure underlying PDs allows the observation of three second-order dimensions, whose characteristics are as follows: socially-inhibited and non-assertive personalities, characterized by specific neuropsychological deficits in sustained attention; aggressive personalities, characterized by impulsiveness and a deficit in the formation of concepts; and non-pathological personalities with obsessive traits, which, as obsessiveness increases, present lower efficacy in tasks of sustained attention and higher psychogalvanic response to stress.

These results are in contrast to the discrete categories and the three clusters of DSM axis II and the CIE-10 PDs classification, based on clinical criteria. On the other hand, they are closer to the findings of Livesley[39], who carried out a series of revisions of the instruments employed for evaluating personality, and obtained a structure of 18 factors, which were reduced to four: emotional alteration, dissocial behaviour, inhibition and compulsiveness. These factors are related to those obtained in this study: deficit in social involvement (inhibition), aggressive personality (dissocial behaviour) and obsessive personality (compulsiveness); emotional alteration may be related to anxiety disorders.

Our study has certain shortcomings, however, that should be taken into account on interpreting the results. First, it is assumed that the structure underlying normal personality (normal group) is related to abnormal personality (clinical group), so that it was decided to carry out all the analyses with the two groups jointly. This assumption, despite being widely accepted in psychopathological research[12,14,15], could perhaps have been analyzed more thoroughly with large samples of subjects from both groups.

Secondly, we conducted exploratory factor analysis as it is the procedure most widely used when the aim is to reduce the amount of variables, to test a given structure of personality, and a dimensional approach is implicitly assumed[40-43]. However, advocates of confirmatory factor analysis consider that the exploratory methodology has its limitations[11], among which are the indeterminate factorial solutions themselves, the problem of the estimation of commonalities and the lower flexibility when comparing the solutions obtained; the greatest advantage of confirmatory factorial analysis is the provision of tests of significance and the indices of fit for the hypotheses proposed[44]. Nevertheless, the requirement for carrying out a confirmatory factorial analysis is availability of theoretical and empirical postulates of the model to be tested, the correlations between constructs, the connection between the constructs and their measures and the correlations between the errors of measurement.

Millon and Davis[45], meanwhile, criticize the use of factorial methodology for describing the structure of the personality, considering that the conclusions derived from the factors obtained with this technique are mere superficial descriptions, which neither explain the true mechanism of relationships between the elements of each factor nor the etiology and development of the disorders. They also point out that information beyond the statistics is necessary not only in order to understand the nature of these disorders, but also for specifying why one scheme is preferable to another.

Livesley[39] also adopts a critical posture, though nevertheless employs this technique as a useful tool in the study of personality traits and disorders. He considers it necessary to take many subjective decisions when using factor analysis, such as choosing the method of rotation, refining imprecise diagnostic definitions, choosing patient populations and naming the factors derived from the analysis.

In any case, Millon and Davis's criticism of factor analysis may be somewhat exaggerated, since when this technique is used, the sole purpose is to find, in an objective and reliable way, a structure of personality - though, of course, making use of other elements to explain the factors obtained, since they are mere numerical structures of a series of observations made. It is precisely when one finds external indicators, of a biological, psychological or environmental nature, which permit the validation of the resulting factors, that one can conclude that this structure might be appropriate for defining PDs. The use, as in this study, of neurocognitive and psychophysiological measures, clearly does not exhaust the possibilities of validation, nor can we be certain that they are the most suitable ones for our purpose. Even so, we opted for these measures on considering that they may allow us to observe certain underlying executive functions or biological processes involved in self-control and self-regulation of behaviour.

Finally, we also consider of interest to note the shortage of the sample used, relative to the number of variables in the factor analyses; accordingly, our findings could be preliminary results, waiting to more studies with larger samples.

REFERENCES

1. Tyrer P, Casey P, Ferguson B. Personality disorder in perspective. Brit J Psychiat 1991;159:463-71.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th ed. Washington, DC: American Psychiatric Association; 1994.
3. Blais M, Norman D. A psychometric evaluation of the DSM-IV personality disorder criteria. J Pers Disord 1997;11: 168-76.

4. Westen D. Divergences between clinical and research methods for assessing personality disorders: Implications for research and the evolution of axis II. Am J Psychiat 1997;154: 895-903.
5. Zimmerman M. Diagnosing personality disorders: a review of issues and research methods. Arch Gen Psychiat 1994;51:225-45.
6. Raine A, Lencz T, Bihrle S, LaCasse L, Colletti P. Reduced prefrontal gray matter volume and reduced autonomic activity in antisocial personality disorder. Arch Gen Psychiat 2000;57:119-27.
7. Newman JP, Wallace JF. Diverse pathways to deficient self-regulation: Implications for disinhibitory psychopathology in children. Clin Psychol Rev 1993;13:699-720.
8. Claridge G, editor. Schizotypy: Implications for illness and health. Oxford: Oxford University Press, 1997.
9. Raine A, Lencz T, Mednick SA, editors. Schizotypal personality. New York: Cambridge University Press, 1995.
10. Goyer P, Anderson P, Semple W, Anita H. Positron-emission tomography and personality disorders. Neuropsychopharmacol 1994;10:21-8.
11. O'Connor BP, Dyce JA. A test of models of personality disorder configuration. J Abnorm Psychol 1998;107:3-16.
12. Costa PT, Widiger TA, editores. Personality disorders and the five-factor model of personality. Washington: American Psychological Association, 1994.
13. Cloninger CR, Svrakic DM. Differentiating normal and deviant personality by the seven-factor personality model. In: Strack S, Lorr M, editores. Differentiating normal and abnormal personality. New York: Springer, 1994; p. 40-64.
14. Cloninger CR, editor. Personality and psychopathology. Washington, DC: American Psychiatric Press, 1999.
15. Siever LJ, Davis KL. A psychobiological perspective on personality disorders. Am J Psychiat 1991;148:1647-58.
16. Millon T. Inventario Clínico Multiaxial de Millon (II): MCMI-II. Madrid: TEA Ediciones, 1997.
17. Caprara GV, Barbanelli C, Borgogni L. Cuestionario «Big Five». Madrid: TEA Ediciones, 1995.
18. Costa PT, McCrae RR. Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual. Odessa: Psychological Assessment Resources, 1992.
19. Stroop JR. Studies of interference in serial verbal reaction. J Exp Psychol Human 1935;18:643-62.
20. Grant DA, Berg EA. A behavioural analysis of degree or reinforcement and ease of shifting to new responses in a Weigltype card sorting problem. J Exp Psychol Human 1948;38: 404-11.
21. Heaton RK, Chelune GJ, Talley J, Kay GG, Curtiss G. Wisconsin Card Sorting Test manual: revised and expanded. Odessa FL: Psychological Assessment Resources, 1981.
22. Rosvold HE, Mirsky AF, Sarason I, Bransome ED, Beck LH. A continuous performance test of brain damage. J Cons Psychol 1956;20:343-50.
23. Gibbons JD. Nonparametric statistics: an introduction. Newbury Park: University Paper, 1993.
24. Dowson JH, Berrios GE. Factor structure of DSM-III-R personality disorders shown by self-report questionnaire: implications for classifying and assessing personality disorders. Acta Psychiat Scand 1991;84:555-60.
25. Hyler S, Lyons M. Factor analysis of the DSM-III personality disorder clusters: A replication? Compr Psychiat 1988;29: 304-8.
26. Kass F, Skodol AE, Charles E, Spitzer RL, Williams JBW. Scaled ratings of DSM-III personality disorders. Am J Psychiatry 1985; 142:627-30.
27. Schroeder ML, Livesley WJ. An evaluation of DSM-III-R personality disorders. Acta Psychiat Scand 1991;84:512-9.
28. Mulder RT, Joyce PR. Temperament and the structure of personality disorder symptoms. Psychol Med 1997;27:99-106.
29. Grilo CM, Skodol AE, Gunderson JG, Sanislow CA, Stout RL, Shea MT, et al. Longitudinal diagnostic efficiency of DSM-IV criteria for obsessive-compulsive personality disorder: a 2-year prospective study. Acta Psychiat Scand 2004;110:64-8.
30. Parker G, Roussos J, Wilhelm K, Mitchell P, Austin MP, Hadzi-Pavlovic D. On modeling personality disorders: are personality style and disordered functioning independent or interdependent constructs? J Nerv Ment Dis 1998;186:709-15.
31. Parker G, Barret E. Personality and personality disorder: current issues and directions. Psychol Med 2000;30:1-9.
32. Tyrer P, Alexander J. Classification of personality disorders. Brit J Psychiat 1979;135:163-7.
33. Wiggins JS, Pincus AL. Conceptions of personality disorders and dimensions of personality. Psychol Assessment 1989;1: 305-16.
34. Chen WJ, Hsiao CK, Lin CCH. Schizotypy in community samples: the three-factor structure and correlation with sustained attention. J Abnorm Psychol 1997;106:649-54.
35. Lenzenweger MF, Cornblatt BA, Putnick M. Schizotypy and sustained attention. J Abnorm Psychol 1991;100:84-9.
36. Rawlings D, Goldberg M. Correlating a measure of sustained attention with a multidimensional measure of schizotypal traits. Pers Indiv Differ 2001;31:421-31.
37. Obiols JE, García Domingo M, de Trincheria I, Domenech E. Psychometric schizotypy and sustained attention in young males. Pers Indiv Differ 1993;14:381-4.
38. Lemos-Giráldez S, Inda-Caro M, López-Rodrigo AM, Paíno-Piñeiro M, Besteiro-González JL. Assessment of essential components of schizotypy using neurocognitive measures. Span J Psychol 2000;4:183-94.
39. Livesley WJ. Suggestions for a framework for an empirically based classification of personality disorders. Can J Psychiat 1998; 43:137-47.
40. Goldberg LR. An alternative «description of personality»: the Big-Five factor structure. J Pers Soc Psychol 1990;59: 1216-29.
41. Noller PLH, Comrey AL. Cattell, comrey, eysenck personality factors compared: more evidence for the five robust factors? J Pers Soc Psychol 1987;53:775-82.

42. Peabody D, Goldberg LR. Some determinants of factor structures from personality-trait descriptors. J Pers Soc Psychol 1989;57:552-67.
43. Zuckerman M, Kuhlamn DM, Camac C. What lies beyond E and N? Factor analyses of scales believed to measure basic dimensions of personality. J Pers Soc Psychol 1988;54:96-107.
44. Church AT, Burke PJ. Exploratory and confirmatory tests of the big five and Tellegen's three- and four-dimensional models. J Pers Soc Psychol 1994;66:93-114.
45. Millon T, Davis RD. Disorders of personality: DSM-IV and beyond, 2nd ed. New York: Wiley, 1996.