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CONFIRMATORY FACTOR ANALYSES OF DSM-IV CLUSTER C PERSONALITY DISORDER CRITERIA

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Notwithstanding its research and clinical relevance, the dimensionality and validity of the *DSM-IV* avoidant, dependent, and obsessive-compulsive personality disorders (PDs) criteria is still a largely unexplored topic. The aim of this study was to test the factor structure for *DSM-IV* Cluster C PD criteria in a sample of 641 consecutively admitted outpatients. Factor analysis results suggested that avoidant, dependent, and obsessive-compulsive PDs share a common latent dimension, and supported the three-factor structure of both observer and self-report ratings of *DSM-IV* Cluster C PD criteria. The pattern of factor loadings, however, was different from the one expected according to the *DSM-IV* classification.

Several studies have suggested that avoidant (APD), dependent (DPD), and obsessive-compulsive (OCPD) personality disorders (PDs) are clinically relevant disorders showing high prevalence rates in clinical samples (Gude & Vaglum, 2001; Mattia & Zimmerman, 2001; Stuart et al., 1998). For instance, in Widiger's (1991) review of the literature, median prevalence rates for *DSM-III-R* APD, DPD, and OCPD were 16.0% (range: 5.0%–55.0%), 20.0% (range: 2.0%–55.0%), and 9.0% (range: 1.0%–20.0%), respectively. Despite these high base rates in clinical populations, there has been less research on these PDs compared with Clusters A and B (Gude & Vaglum, 2001). This is of particular concern given that PDs are at a crossroads with respect to theory, research, and conceptualization (Endler & Kocovski, 2002).

The *DSM-IV* (American Psychiatric Association [APA], 1994) conceptualizes APD, DPD, and OCPD—as well all other PDs—as discrete, uni-factorial nosological entities. Although it is explicitly stated in the *DSM-IV* that

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the PD clustering system has not been validated, APD, DPD, and OCPD are assumed to share a common anxious or fearful dimension, and are therefore grouped together in Cluster C, consistent with conceptualizations of PDs in both the *DSM-III* (APA, 1980) and *DSM-III-R* (APA, 1987). Empirical studies have provided mixed findings on this topic. On the one hand, the high co-occurrence rates that are frequently observed among APD, DPD, and OCPD seem to support the hypothesis of a common etiologic core (e.g., Alden, Laposa, Taylor, & Ryder, 2002; Stuart et al., 1998); on the other hand, such co-occurrence data may call into question the discriminant validity of these PD criterion sets. For example, Stuart and colleagues (1998) found that 43% of APD patients met criteria for DPD, and that 59% of DPD patients met criteria for APD. These comorbidity rates question the assumption that the APD and DPD criterion sets are dissociable. To confuse matters further, comorbidity rates of Cluster C PDs with PDs from Clusters A and B are also elevated (Ekselius, Lindstrom, von Knorring, & Bodlund, 1994).

Factor analytic techniques may be useful in assessing the proper number of latent variables that are needed to explain the covariation observed among the APD, DPD, and OCPD criteria, and in evaluating the convergent and discriminant validity of each diagnostic indicator (Gorsuch, 1983). Considering studies on the factor structure of PD criteria, for instance, there is strong evidence that schizotypal PD features are not unidimensional (Vollema & van den Bosch, 1995). Rather, at least two and perhaps three latent dimensions underlie the correlations among the schizotypal PD diagnostic criteria (Vollema & van den Bosch, 1995). Recently, a three-factor structure was also proposed for borderline PD criteria (Sanislow, Grilo et al., 2002), although the status of the latent structure of borderline PD features as dimensional or discrete remains controversial (Fossati et al., 1999). Hyler and collegues (1990) conducted a factor analysis of the entire *DSM-III* PD item set. Their results yielded 11 factors that did not correspond to the *DSM-III* PDs. There was also considerable redundancy among the factors.

With respect to the Cluster C PDs, only two studies have addressed the latent structure of APD. Baille and Lampe (1998) used confirmatory factor analysis to test the factor structure of *DSM-IV* APD criteria. Their results showed a good fit for the one-factor model, thus providing evidence for the *DSM-IV* unidimensional model of APD. Baille and Lampe, however, factor analyzed only the seven APD criteria, and did not provide evidence for the discriminant validity of APD with respect to other PDs, particularly Cluster C diagnoses. This limitation was addressed by Sanislow, Morey et al. (2002), who factor analyzed simultaneously the *DSM-IV* APD and OCPD features (as well as borderline and schizotypal PD features). Their results supported a unidimensional model of APD and OCPD diagnostic criteria. Although this study was well designed and the sample size was large, its conclusions are limited by the suboptimal values reported for the wide majority of fit indices for the best-fitting model, suggesting that other models that were not considered may have better described the observed inter-item correlations. Surprisingly, until now no factor analytic studies of the *DSM-IV* DPD criteria have been reported, although data from a study by Livesley, Schroeder, and Jackson (1990) seem to suggest that DPD features may not be unidimensional.

Adding to the controversy surrounding the validity of Axis II diagnoses, factor analytic studies of the *DSM-III-R* Axis II disorders conducted to evaluate the latent dimensions underlying the 11 PDs, and not individual PD criteria, have provided mixed findings regarding the validity of the *DSM-III-R* PD clusters. O'Connor and Dyce (1998) stated that "the level of fit with previous data sets achieved by the three-dimensional *DSM* configuration proved to be a challenging standard" (p. 14). Nevertheless, the same authors suggested that PD inter-correlations could be better explained by a four-factor structure. Interestingly, the O'Connor and Dyce four-factor model of PDs did not replicate the *DSM* Cluster C. Rather, APD and DPD loaded together on one factor, with OCPD loading on a different factor.

With these considerations in mind, we set out to evaluate whether the *DSM-IV* APD, DPD, and OCPD diagnoses loaded on a common latent factor by factor analyzing the 12 categorically diagnosed *DSM-IV* PDs in a large sample of consecutively admitted outpatients. Next, we designed a confirmatory factor analytic study to test the validity of *DSM-IV* Cluster C PD criteria. In order to address possible biases due to observer expectations and/or psychometric instrument format, we factor analyzed separately both observer and self-report ratings of Cluster C PD criteria. Next, we formally assessed the congruence of the factor structures based on self-report and interview data. Item-level factor analyses were carried out using both confirmatory techniques based on structural equation modeling, and on an alternative method based on targeted rotations. The latter method was developed by McRae, Zonderman, Costa, Bond, and Paunonen (1996) to overcome the difficulties of applying standard confirmatory factor analysis models to non-simple structures; that is, structures that are characterized by variables showing non-zero loadings on two or more factors. Such data are frequently encountered in research on personality (Church & Burke, 1994) and on personality pathology (O'Connor & Dyce, 1998).

METHOD

PARTICIPANTS

Participants were 641 outpatients admitted consecutively to the Clinical Psychology and Psychotherapy Unit of the San Raffaele Hospital of Milan, Italy, from January 2000 to September 2003. All volunteered to participate in the study after a detailed description was presented, and all were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (APA, 1992). The sample included 248 (38.7%) males and 393 (61.3%) females. The mean age was 33.5 years ($SD = 10.6$). In order to be included in the sample, participants could not meet any of the following exclusionary criteria: (1) an IQ < 75 as assessed by the official Italian version of the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1997); (2) a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder, delusional disorder, dementia, or organic mental disorder according to the diagnostic criteria listed in the *DSM-IV* (APA, 1994) as assessed by the Italian translation of the Mini International Neuropsychiatric Interview (Lecrubier et al., 1997; Sheehan et al., 1997); and/or (3) an educational level lower than elementary school. Of the 641 participants, 319 (49.8%) received at least one *DSM-IV* Axis I diagnosis. Axis I disorders were assessed by the clinicians who followed the participants in treatment. The most frequently diagnosed Axis I disorders were anxiety disorders ($n = 126$, 19.7%), substance abuse/dependence disorders ($n = 83$, 12.9%), eating disorders ($n = 51$, 8.0%), and mood disorders ($n = 44$, 6.9%). According to the Structured Clinical Interview for *DSM-IV* Axis II Personality Disorders, Version 2.0 (SCID-II, First, Spitzer, Gibbon, Williams, & Benjamin,1994; see below), 420 participants (65.5%) received at least one *DSM-IV* PD diagnosis. The most frequently diagnosed PDs were narcissistic ($n = 115$, 17.9%), passive-aggressive ($n = 83$, 12.9%), histrionic ($n = 76$, 11.9%), obsessive-compulsive ($n = 66$, 10.3%), avoidant ($n = 58$, 9.0%), and dependent ($n = 38$, 5.9%). The relatively low frequency of borderline PD diagnosis ($n = 27$, 4.2%) which was observed in this study could represent both a consequence of investigating an outpatient sample and a possible cultural difference between Italy and other countries; in any case, this limits the generalizability of our findings. Among subjects with at least one PD diagnosis, the average number of diagnoses was 2.0 ($SD = 0.77$), indicating that multiple PD diagnoses were frequent in this sample.

MEASURES

SCID-II PD Assessments. As mentioned above, observer ratings of *DSM-IV* Cluster C PDs were gathered by administering the SCID-II (First et al.,1994) to all participants. The SCID-II is a 140-item semistructured clinical interview organized by diagnosis that yields both a categorical and a dimensional (i.e., number of symptoms) assessment of *DSM-IV* PDs. Participants with Axis I diagnoses were administered the SCID-II by expert trained raters after acute symptom remission according to the judgment of the clinicians who were following the participants in treatment. Interrater reliability of the *DSM-IV* Cluster C PD symptoms was assessed on the first 50 consecutively admitted participants using a pairwise interview design. For categorical diagnoses, median Cohen's κ values were .79 for APD, .70 for DPD, and .89 for OCPD. For dimensional symptom counts, intraclass correlation coefficients were .95 for APD, .91 for DPD, and .94 for OCPD.

Self-Report PD Ratings. All subjects received and completed the SCID-II Personality Questionnaire (PQ; First et al., 1994). The PQ is a 117 true/false item, self-report questionnaire designed to screen several *DSM-IV* PD symptoms. The PQ provides at least one question for each *DSM-IV* PD criterion, with the exception of three criteria of schizotypal PD, two criteria of histrionic PD, and all the adult criteria of antisocial PD, which are probed directly during the interview. In the case of Cluster C PDs, the number of PQ items corresponds directly to the number of criteria listed in the *DSM-IV*. The PQ items are simply listed sequentially with no evident item sections or groupings. The PQ does not provide categorical diagnoses of the *DSM-IV* PDs; it simply screens for the presence of the individual symptoms. In the present study, the PQ was administered roughly 7 days before the SCID-II. In this sample, receiver operating characteristic (ROC) curves indicated that PQ scores had moderate convergent validity with respect to SCID-II Cluster C PD categorical diagnoses. In particular, the values of the area under the ROC curves were .83 (*SE* = .02, 95% CI = .78–.87), .83 (*SE* = .04, 95% CI = .76–.90), and .76 (*SE* = .030, 95% CI = .70–.82) for APD, DPD, and OCPD, respectively. The SCID-II interviews were carried out independently from, and blind to, PQ self-reports.

STATISTICAL ANALYSES

Scale-Level Factor Analysis. Since the PQ does not provide *DSM-IV* PD diagnoses, only SCID-II categorical PD diagnoses were used to compute the tetrachoric correlation matrix to be decomposed using principal axis factor analysis. The questions raised by Church and Burke (1994) as to the applicability of confirmatory factor analysis to personality variables suggested the use of the targeted rotation procedure proposed by McRae and collegues (1996). Following their suggestions, we assessed the correct number of factors to be extracted from the tetrachoric correlation matrices using four different methods; namely, the scree plot, parallel analysis, the minimum average partial statistic (MAP; Zwick & Velicer, 1986), and Everett's (1983) factor comparability method. The varimax procedure was used to rotate the extracted factors. Congruence coefficients (CC) were computed in order to evaluate if the rotated factors matched the binary target matrix of 1s and 0s representing the hypothesized factor loadings based on the *DSM-IV* model; a CC value of .90 is typically considered necessary to define a matching factor.

In order to examine the extent to which differences between the target and the varimax matrix were due solely to the orientation of the axes, we used Schönemann's (1966) technique for rigid Procrustes rotation. After performing the targeted rotation, we computed factor, variable, and total CCs between the target matrix and the Procrustes-rotated replication matrix. Variable CCs were computed because the informal method of simply identifying variables that do or do not load as expected can be problematic when arbitrary cutoff values are applied to a structure that is not simple; in this case, variable CCs seem to be appropriate indices of the replicability of factor loadings for individual variables (McCrae et al., 1996). In other words, variable CC values indicate the extent to which variables load on their expected factors and do not load on other factors, and they reflect both variable convergent and discriminant validity issues. The significance of the congruence coefficients was tested by comparing the observed factor congruences with the distribution of congruences obtained after Procrustes rotation of the data to 1,000 independent random targets (which were obtained by randomly permuting the elements of the original target matrix). If the fit of the real data set was greater than 95% of the random target fits, we were able conclude with better than 95% confidence that the fit of the real data is not simply due to capitalization on chance.

Item-Level Factor Analyses. Weighted least square confirmatory factor analyses of both observer and self-report ratings of the *DSM-IV* Cluster C PD criteria were carried out using LISREL 8.12A (Jöreskog & Sörbom, 1993). Considering the multidimensional nature of fit assessment in structural equation models and the need for multiple fit indices (Tanaka, 1993), we used several measures to identify model fit, including the χ^2 goodness-of-fit statistic; Browne and Cudeck's (1993) root mean square error of approximation (RMSEA); the Tucker-Lewis index (TLI), Bentler's (1990) comparative fit index (CFI), and Bollen's (1989) incremental fit index (IFI); and the standardized root mean squared residual (SRMR). RMSEA values were corrected for multisample analyses (Steiger, 1998), as in the case of random splitting for the Everett's (1983) factor comparability procedure. The test of close fit and 90% confidence intervals were computed to test if the RMSEA value was $\leq$0.05 at population level (Browne & Cudeck, 1993). Following Hu and Bentler's (1999) suggestions, TLI, CFI, and IFI values $\geq$.95, RMSEA values close to .06, and SRMR close to .08 were considered as indicating good model fit.

Items were assigned to each factor based on the *DSM-IV* model. A single-factor model in which APD, DPD, and OCPD criteria were forced to load on a common factor was tested as a competing model. Up to now, alternative structural models of Cluster C PD criteria have not been presented in the scientific literature. This fact made it impossible to test other multifactor models in the case of inadequate fit of the *DSM-IV* model of Cluster C PDs, yet we avoided empirical re-specification of the model using modification indices since it is well known that this procedure excessively capitalizes on chance and on the characteristics of the sample at hand (Bollen, 1989). The null factor model was used as a baseline model.

Taking into account the issues that were raised by Church and Burke (1994) (see above), we performed the targeted rotation procedure proposed by McRae and collegues (1996). In addition to the usual fit measures, we also computed variable CC coefficients; these are important measures since they examine the replicability of factor loadings for individual variables and take into account both convergent and discriminant validity issues, assessing how well the individual Cluster C PD criteria belong only to their corresponding PD, with no systematic relationship with other Cluster C PDs.

RESULTS

DESCRIPTIVE STATISTICS

In this study, according to SCID-II, base rate estimates were 10.3%, 9.0%, and 5.6% for OCPD, APD, and DPD, respectively. It should be noted that these prevalence estimates are in the lower end of base rate estimates that have been reported for these PDs in clinical samples (Widiger, 1991). The mean and *SD* values for the dimensionally assessed APD, DPD, and OCPD diagnoses were 0.81 ($SD = 1.54$; min. = 0, max. = 7), 1.00 ($SD = 1.49$; min. = 0, max. = 8), and 1.03 ($SD = 1.52$; min. = 0, max. = 8), respectively; kurtosis values ranged from 1.94 (OCPD) to 4.53 (APD), and skewness values ranged from 1.63 (OCPD) to 2.24 (APD).

Consistent with previous observations (Alden et al., 2002; Stuart et al., 1998), significant correlations were observed among the *DSM-IV* Cluster C PDs. In particular, APD and DPD diagnoses were significantly correlated, $\phi = .40$, $p < .001$, as were OCPD and APD diagnoses, $\phi = .36$, $p < .001$. A small yet significant correlation was observed between DPD and OCPD, $\phi = .09$, $p < .05$. No other significant correlations were observed between the non-Cluster C PDs listed on Axis II of the DSM-IV and APD (median $\phi = -.06$, min. $\phi = -.15$, max. $\chi = -.03$), DPD (median $\phi = -.05$, min. $\phi = -.10$, max. $\phi = -.02$), and OCPD (median $\phi = -.03$, min. $\phi = -.12$, max. $\phi = .03$), respectively.

A significantly higher rate of DPD diagnoses was observed among female participants (8.4%) compared with male participants (2.0%), Yates-corrected χ^2 (1, $N = 641$) = 9.99, $p < .01$; however, the effect size of this association was small, $\phi = .13$. No significant associations were observed between sex and APD and OCPD, respectively. Forty-one APD subjects (70.7%) and 29 DPD subjects (76.3%) received at least one Axis I diagnosis, whereas only 50% ($n = 33$) of OCPD subjects received any Axis I diagnosis. Considering the individual Axis I diagnoses, significant associations were observed between anxiety disorders and both APD, Yates-corrected χ^2 (1, $N = 641$) = 7.87, $p < .01$, and DPD, Yates-corrected χ^2 (1, $N = 641$) = 6.44, $p < .02$; however, the effect size estimates were small for both APD, $\phi = .12$, and DPD, $\phi = .11$.

K-R 20 coefficient values for SCID-II APD, DPD, and OCPD symptom criteria were .81 (average inter-item $r = .39$), .70 (average inter-item $r = .23$), and .71 (average inter-item $r = .24$), respectively. K-R 20 values for PQ APD, DPD, and OCPD scales were .73 (average inter-item $r = .27$), .61 (average inter-item $r = .16$), and .53 (average inter-item $r = .12$), respectively. Item-total correlations corrected for item-total overlap and descriptive statistics for observer and self-report ratings of the *DSM-IV* Cluster C PD criteria are listed in Table 1. As a whole, self-report ratings yielded a substantially higher proportion of subjects meeting the *DSM-IV* Cluster C PD criteria. Moreover, the item total correlations for the PQ scales were somewhat smaller than the corresponding correlations for the SCID-II ratings. In particular, the item-total *r* coefficient that was observed for PQ DPD item 5

TABLE 1. Item Analyses for Observer and Self-Report Ratings of the *DSM-IV* Cluster C Personality Disorder Criteria (*N* = 641)

	Observer (SCID-II) Ratings		Self-Report (PQ) Ratings	
***DSM-IV* Criteria (abridged)**	***P***	r_{it}	***P***	r_{it}
Avoidant Personality Disorder				
1. Avoids occupational activities	.06	.50	.27	.41
2. Is unwilling to get involved with people	.11	.68	.36	.51
3. Shows restraint within intimate relationships	.09	.49	.36	.35
4. Is preoccupied with being criticized	.18	.55	.61	.46
5. Is inhibited in new interpersonal situations	.12	.62	.55	.39
6. Views self as socially inept	.13	.56	.48	.48
7. Is unusually reluctant to take personal risks	.11	.49	.45	.45
Dependent Personality Disorder				
1. Has difficulty making everyday decisions	.07	.37	.22	.32
2. Needs others to assume responsibility	.09	.40	.41	.37
3. Has difficulty expressing disagreement	.13	.41	.39	.21
4. Has difficulty initiating projects	.12	.41	.36	.39
5. Goes to excessive lengths to obtain nurturance	.11	.28	.34	.04
6. Feels uncomfortable when alone	.16	.41	.28	.35
7. Urgently seeks another relationships	.20	.39	.46	.30
8. Fears being left to take care of him/herself	.13	.48	.42	.50
Obsessive-Compulsive Personality Disorder				
1. Is preoccupied with details	.12	.45	.42	.29
2. Shows perfectionism	.12	.44	.42	.24
3. Is excessively devoted to work	.09	.47	.21	.28
4. Is overconscientious	.13	.49	.54	.24
5. Is unable to discard worn-out objects	.13	.31	.58	.21
6. Is reluctant to delegate tasks	.12	.35	.47	.33
7. Adopts a miserly spending style	.07	.27	.17	.20
8. Shows rigidity and stubborness	.23	.47	.74	.20

Note. P = proportion of subjects passing the item; r_{it} = corrected item-total correlations

was unacceptably low. It should be noted that as a whole, item-total correlations placed APD, DPD, and OCPD criteria in a different rank order with respect to the order that is proposed by the *DSM-IV*. For instance, if we consider interview data, the best performing items in terms of item-total *r* values were item 2, item 8, and item 4 for APD, DPD, and OCPD respectively.

FACTOR ANALYSES

Scale-Level Factor Analysis. Only the first four eigenvalues of the PD tetrachoric correlation matrix were greater than 1.00 (2.9, 1.9, 1.4, and 1.1, respectively), suggesting a four-factor model of *DSM-IV* PDs. Comparability coefficients (i.e., factor score correlations) computed across two random subsamples for the one-factor, two-factor, three-factor, four-factor, and five-factor solutions were as follows: (1) .99; (2) .97, .95; (3) .97, .95, .90; (4) .93, .97, .90, .91; and (5) .91, .90, .96, .98, .64. This result indicated that only the first four factors could be safely replicated across two independent random subsamples of roughly equal size. Thus, Everett's (1983) criterion also supported a four-factor model of the *DSM-IV* PDs. All other indices used in this study also supported a four-factor solution.

Promax and varimax rotations yielded almost identical solutions, with factor score correlations ranging from .98 (factor 3) to 1.00 (factor 2). Moreover, the factor intercorrelations after promax rotation were in the small-to-moderate range (median $r = -.09$, min. $r = -.38$, max. $r = .15$), suggesting the existence of a small overlap between factors. The varimax-rotated factor loading matrix is listed in Table 2. APD, DPD, and OCPD (as well as depressive PD) showed substantial loadings on Factor 1 and near-zero loadings on the other factors. This result was consistent with the *DSM-IV* clustering of PDs and suggested that a convergent-dicriminant validity analysis of the individual *DSM-IV* diagnostic criteria be conducted for APD, DPD, and OCPD within the realm of Cluster C PDs. Consistent with the *DSM-IV* model, paranoid, schizotypal, and schizoid PDs loaded on the same common factor (Factor 2), thus reproducing Cluster A. Our results, however, did not identify a latent dimension corresponding to Cluster B. In fact, antisocial and borderline PDs loaded on Factor 4, whereas narcissistic and histrionic PDs (as well as passive-aggressive PD) loaded on a separate factor (Factor 3). After removing passive-aggressive and depressive PDs, which are not included in the *DSM-IV* clusters, the CC values of Factor 1, Factor 2, Factor 3, and Factor 4 with the binary target matrix of the *DSM-IV* Cluster C, Cluster A, and Cluster B PD classifications were .91, .95, .67, and .73, respectively. After excluding depressive PD, we also tried a rigid Procrustes rotation of our varimax loading matrix to O'Connor and Dyce's (1998) four-factor target matrix. In this analysis, CC values were poor, ranging from .46 to .64 (absolute values), and nonsignificant.

The four factors cumulatively explained roughly 61.1% of scale-level PD variance, with communality estimates ranging from .19 (histrionic PD) to .89 (narcissistic PD), with a median value of .37 ($M = .45$, $SD = .22$). The goodness-of-fit index (GFI) and SRMR values were .99 and .03, respectively, indicating that the four-factor solution adequately reproduced the observed correlations.

TABLE 2. Varimax-Rotated Factor Loading Matrix of the DSM-IV Personality Disorders

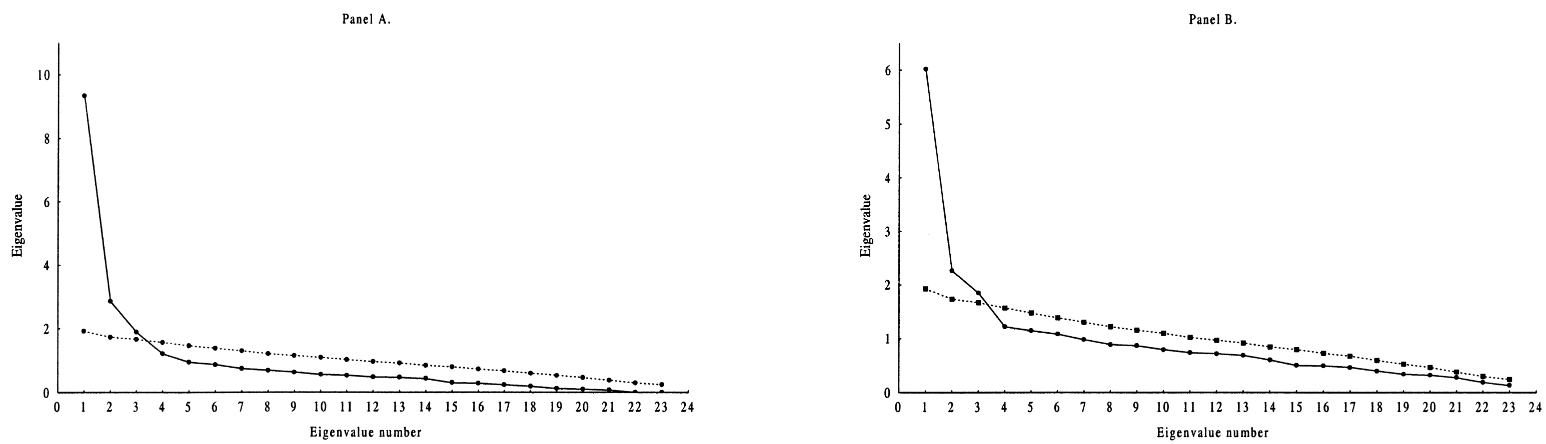
Personality Disorders	Factor 1	Factor 2	Factor 3	Factor 4
Avoidant	.80	.05	–.10	–.05
Dependent	.54	–.15	–.11	–.06
Obsessive-Compulsive	.44	.07	–.11	–.12
Passive-Aggressive (Negativistic)[a]	–.14	–.05	.51	.28
Depressive[a]	.74	–.04	–.15	–.03
Paranoid	–.07	.49	.09	–.05
Schizotypal	–.03	.85	–.16	.02
Schizoid	.06	.62	–.08	.01
Histrionic	–.27	–.23	.30	.02
Narcissistic	–.27	–.02	.90	.04
Borderline	–.09	–.02	.10	.64
Antisocial	–.06	–.01	.07	.57

Note. [a]Personality disorder provided by the *DSM-IV* for further study. The *DSM-IV* personality disorders are listed in SCID-II order.

Item-Level Factor Analyses. The one-factor model of Cluster C PD features fitted the data poorly for both the SCID-II, χ^2 (230) = 1715.21, $p <$ .001, RMSEA = .10, $p < .001$, SRMR = .32, TLI = .87, CFI = .88, IFI = .88; and PQ ratings, χ^2 (230) = 957.28, $p < .001$, RMSEA = .07, $p < .001$, SRMR = .19, TLI = .70, CFI = .72, IFI = .73. Furthermore, the *DSM-IV* three-factor model of Cluster C PDs did not show a better fit than the unidimensional model for the SCID-II data, χ^2 (227) = 1742.78, $p < .001$, RMSEA = .10, $p <$ .001, SRMR = .17, TLI = .87, CFI = .88, IFI = .88. Interestingly, factor correlations ranged from .50 to .80, indicating that the three factors were substantially correlated, but they were not redundant. In the case of the PQ self-report ratings, the three-factor model of Cluster C PD features based on the *DSM-IV* fitted better than the unidimensional model, but the wide majority of the goodness-of-fit statistics indicated that it did not reproduce adequately the observed inter-item correlations, χ^2 (227) = 802.48, $p < .001$, RMSEA = .063, $p < .001$, SRMR = .16, TLI = .76, CFI = .78, IFI = .78. Factor inter-correlations were similar to those observed for the three-factor model based on SCID-II data (min $r = .69$, max. $r = .89$), suggesting that the three factors were not redundant.

Interestingly, the inspection of modification indices for the 46 factor loadings that were fixed to .00 according the *DSM-IV* specifications indicated that 69.6% ($n = 32$) of them in the case of SCID-II data, and 34.8% of them in the case of PQ ratings, were significant even when using a Bonferroni-corrected significance level of $p < .001$. These data suggest that a non-simple factor structure may be among the causes of the lack of fit of the *DSM-IV* three-factor model of the Cluster C PD criteria.

When we turned to the targeted rotation procedure (McRae et al., 1994), the dimensionality analyses strongly supported a three-factor structure for both SCID-II and PQ ratings of Cluster C PDs. As shown in Figure 1 (see Panels A and B), the scree plots were flat after the third eigenvalue for both SCID-II and PQ data, suggesting that only the first three factors should be extracted for both interview and self-report. It should be stressed that only the first three eigenvalues were greater than the corresponding average random eigenvalues. Thus, parallel analysis results also supported a three-factor model of Cluster C PD criteria. Finally, as indicated in Panel C, Everett's (1983) criterion supported the extraction of no more than three factors for both SCID-II and PQ data, since in both cases adding a fourth factor yielded a nonreplicable latent variable. MAP analysis results for the first 11 factors extracted from the Cluster C PD feature correlation matrix based on SCID-II ratings were as follows: .013, .011, .010, .013, .016, .020, .029, .034, .041, .048. Similar values were observed when the MAP analysis was carried out on PQ data. The MAP method examines the root mean square correlation among the variables after partialing the components extracted and selects the number of factors that minimizes this value. The MAP statistic reached its minimum value when three factors were extracted, suggesting, in agreement with all the other criteria used in this study for determining the correct number of factors, a three-factor structure for the *DSM-IV* Cluster C PD criteria.



Panel C

Factor comparabilities (factor score correlations) for extracted factors

	SCID-II				PQ			
Factors	1st	2nd	3rd	4th	1st	2nd	3rd	4th
4	.93	.90	.92	.64	.93	.87	.87	.49
3	.95	.95	.91		.97	.94	.92	
2	.95	.90			.94	.92		
1	.98				.99			

FIGURE 1. Dimensionality analysis results for SCID-II and Personality Questionnaire (PQ) inter-item correlation matrices for the DSM-IV Cluster C personality disorder criteria. Panels A and B lists the scree plot and parallel analysis results for SCID-II and PQ data, respectively. Solid line = real data; dotted line = random data. Factor comparability analysis results are listed in Panel C. The factor comparability coefficients were computed by calculating factor score correlations across two random subsamples composed by 341 and 340 subjects, respectively.

The three-factor solution fitted the observed tetrachoric correlations adequately for both SCID-II (SRMR = .06, GFI = .98) and PQ (SRMR = .06, GFI = .97) data. The eigenvalues of the first three factors were 9.34, 2.86, and 1.90 for SCID-II ratings, and 6.02, 2.26, and 1.85 for PQ ratings. The percentages of variance in PD items that were explained by the first three factors were 61.3% and 44.1% for the SCID-II and the PQ data, respectively.

The varimax and promax rotations yielded almost identical factor structures of the *DSM-IV* Cluster C PD criteria for both the SCID-II (min. CC = .95, max. CC = .97), and the PQ (all CCs value were approximately .96). Interestingly, the promax rotations yielded factor correlation coefficients ranging from .30 to .52 for SCID-II data, and from .15 to .48 for PQ data. None of these values was large enough to suggest factor redundancy.

After axis realignment, the CC values between each varimax rotated factor based on SCID-II ratings and the corresponding binary target matrix based on the *DSM-IV* model of Cluster C PD criteria were as follows: APD CC = .87; DPD CC = .89; OCPD CC = .90. The CC values for APD, DPD, and OCPD based on PQ ratings were .85, .79, and .88, respectively. None of these values suggested that the extracted factors matched the expected factor structure based on the *DSM-IV* model.

Finally, to examine the extent to which differences between the target and the varimax matrix were due solely to the orientation of the axes, we preformed Schönemann's (1966) orthogonal targeted rotation. The factor loadings and CC values after Procrustes orthogonal rotations of the factor extracted from the tetrachoric correlation matrix of the Cluster C PD criteria based on SCID-II ratings are listed in Table 3. The differences between the empirical factor structure and the structure that was expected according to the *DSM-IV* model of Cluster C PD criteria were not due simply to axis orientation, since the factor CC values did not improve after Procrustes rotation. Rather, these differences seem to be explained more adequately by the factor complexity of nine *DSM-IV* criteria. Although all of the Cluster C PD criteria showed their largest loadings on the factor that was expected according to the *DSM-IV* model (i.e., they showed adequate convergent validity), APD criteria 4, 6, and 7 showed non-negligible loadings (i.e., factor loadings >.30) on the DPD factor. Additionally, APD item 7 showed a substantial loading on the OCPD factor. Finally, DPD criteria 1 thru 4 and OCPD criteria 1 and 7 showed substantial loadings on the APD factor. These nine Cluster C PD criteria also showed variable CC values that were nonsignificant and below the .90 cut-off, which usually indicates that a variable belongs to its expected factor. Interestingly, according to both the magnitudes of factor loadings and CC values, the *DSM-IV* rank order of the Cluster C PD criteria based on their diagnostic efficiency was not reproduced in this study. This was particularly evident in the case of DPD, where the last three criteria were the best descriptors of this PD and were the only DPD features to be clearly unidimensional.

The Procrustes rotation results for PQ factors are listed in Table 4. The

TABLE 3. Procrustes Analysis Results for the SCID-II Factors Rotated to the DSM-IV Cluster C Personality Disorder Target Structure (*N* = 641)

	Factors			Variable
	APD	DPD	OCPD	Congruences
Avoidant Personality Disorder				
1. Avoids occupational activities	.78	.17	.23	.94[a]
2. Is unwilling to get involved with people	.83	.30	.27	.90[a]
3. Shows restraint within intimate relationships	.81	.02	.09	.99[b]
4. Is preoccupied with being criticized	.68	.33	.22	.86
5. Is inhibited in new interpersonal situations	.78	.29	.24	.90[a]
6. Views self as socially inept	.68	.36	.22	.85
7. Is unusually reluctant to take personal risks	.63	.32	.39	.78
Dependent Personality Disorder				
1. Has difficulty making everyday decisions	.42	.56	.28	.74
2. Needs others to assume responsibility	.39	.60	.01	.84
3. Has difficulty expressing disagreement	.45	.49	.28	.68
4. Has difficulty initiating projects	.38	.57	.12	.82
5. Goes to excessive lengths to obtain nurturance	.22	.42	.15	.84
6. Feels uncomfortable when alone	.02	.72	.10	.99[b]
7. Urgently seeks another relationships	.04	.70	.08	.99[b]
8. Fears being left to take care of him/herself	.24	.78	.01	.96[a]
Obsessive-Compulsive Personality Disorder				
1. Is preoccupied with details	.14	.15	.70	.96[a]
2. Shows perfectionism	.20	.14	.68	.94[a]
3. Is excessively devoted to work	.21	.17	.75	.94[a]
4. Is overconscientious	.22	.11	.75	.95[a]
5. Is unable to discard worn-out objects	.41	.16	.43	.70
6. Is reluctant to delegate tasks	.09	.13	.58	.97[a]
7. Adopts a miserly spending style	.35	.04	.43	.78
8. Shows rigidity and stubborness	.08	–.09	.78	.99[b]
Factor/Total congruences		.89[b]		.88[b]

Note. APD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder.
The personality disorder criteria are adapted from the *DSM-IV* and are listed in the *DSM-IV* order.
[a]Congruence higher than that of 95% of rotations from random data.
[b]Congruence higher than that of 99% of rotations from random data.

factor structure of the Cluster C PD self-report ratings was highly similar to the factor structure of the SCID-II Cluster C PD ratings. In particular, the factor CC coefficients were .98, .91 and .93 for the APD, DPD, and OCPD factor, respectively. The differences between the PQ factor structure and the SCID-II factor structure are mainly due to the different performance of five Cluster C PD criteria. Differently from what has been observed for the SCID-II data, the APD items 6 and 7 showed adequate variable CC values when a self-report measure of APD was used. In contrast, OCPD item 2 did not perform as well as an OCPD diagnostic criterion in the case of self-report PD assessment. The DPD items 3 and 5 showed poorer loadings and variable CC values in the case of PQ ratings than in the case of SCID-II ratings.

DISCUSSION

As a whole, the results of this study support the *DSM-IV* nomenclature placing APD, DPD, and OCPD within a common latent domain (i.e., the so-

TABLE 4. Procrustes Analysis Results for the Personality Questionnaire Factors Rotated to the DSM-IV Cluster C Personality Disorder Target Structure (N = 641)

	Factors			Variable
	APD	DPD	OCPD	Congruences
Avoidant Personality Disorder				
1. Avoids occupational activities	.58	.15	.23	.90[a]
2. Is unwilling to get involved with people	.72	.17	.17	.95[a]
3. Shows restraint within intimate relationships	.58	−.05	.12	.98[a]
4. Is preoccupied with being criticized	.57	.38	.33	.75
5. Is inhibited in new interpersonal situations	.58	.03	.09	.99[b]
6. Views self as socially inept	.63	.15	.20	.93[a]
7. Is unusually reluctant to take personal risks	.65	.31	.06	.90[a]
Dependent Personality Disorder				
1. Has difficulty making everyday decisions	.45	.45	.01	.70
2. Needs others to assume responsibility	.29	.54	−.02	.88
3. Has difficulty expressing disagreement	.52	.15	.09	.27
4. Has difficulty initiating projects	.35	.63	−.01	.87
5. Goes to excessive lengths to obtain nurturance	.07	−.01	.21	−.03
6. Feels uncomfortable when alone	.04	.65	.08	.99[b]
7. Urgently seeks another relationships	.03	.55	.11	.98[a]
8. Fears being left to take care of him-/herself	.32	.73	−.01	.92[a]
Obsessive-Compulsive Personality Disorder				
1. Is preoccupied with details	.08	.06	.52	.98[a]
2. Shows perfectionism	.20	.39	.31	.58
3. Is excessively devoted to work	.16	−.08	.57	.95[a]
4. Is overconscientious	.06	.14	.38	.93[a]
5. Is unable to discard worn-out objects	.12	.14	.33	.87
6. Is reluctant to delegate tasks	.11	.10	.59	.97[a]
7. Adopts a miserly spending style	.34	.10	.29	.63
8. Shows rigidity and stubborness	.01	−.06	.45	.99[b]
Factor/Total congruences	.85[b]	.79[b]	.88[b]	.83[b]

Note. APD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder.
The personality disorder criteria are adapted from the *DSM-IV* and are listed in the *DSM-IV* order.
[a]Congruence higher than that of 95% of rotations from random data.
[b]Congruence higher than that of 99% of rotations from random data.

called Cluster C). With the exception of depressive PD, no other non-Cluster C PD showed substantial loading on this latent dimension. This result seems to indicate that, with respect to previous findings (Ekselius et al., 1994), the modifications that were entered in the *DSM-IV* Axis II criteria were successful in substantially reducing the overlap of APD, DPD, and OCPD with both Cluster A and Cluster B PDs. In contrast with previous *DSM* models, *DSM-IV* passive-aggressive (negativistic) PD did not load on the same factor of APD, DPD, or OCPD; rather, it appeared to belong to a latent dimension which was also common to narcissistic and histrionic PDs. It was interesting to observe that antisocial and borderline PDs loaded on a common, but separate factor. These data suggest that the *DSM-IV* Cluster B might be split into two distinct subgroups characterized by impulsive-aggressive (i.e., antisocial and borderline PDs) and dramatic (i.e., histrionic and narcissistic PDs) features, respectively.

Our results also suggest that depressive PD should be listed in a future revision of the *DSM* within Cluster C. As a whole, these results indicate a need for further studies linking the factor structure of PDs to the factor structure of normal personality traits in order to gain a better understanding of the real meaning of the latent dimensions that cluster the individual PDs (O'Connor & Dyce, 1998; Widiger, 1991).

Consistent with previous findings (Baille & Lampe, 1998; Sanislow, Grilo et al., 2002), our data indicate that within the Cluster C domain, APD, DPD, and OCPD represent dissociable, unidimensional PD constructs, with latent structures that can be largely replicated across interview and self-report data. However, the substantial between-factor correlations and the high within-cluster covariation suggest that these PDs should be considered as distinct points falling along a common latent continuum; in other words, our results suggest that a future revision of the *DSM* might integrate descriptions of the individual APD, DPD, and OCPD diagnostic entities with a dimensional assessment of their common latent structure. For instance, the dimension of behavioral inhibition (Pickering & Gray, 1999) could be hypothesized to explain the inhibited behavior that is common to all cluster C PDs (e.g., inhibition of socialization behaviors in APD, inhibition of emancipatory attitudes in DPD, and behavioral overcontrol in OCPD). Moreover, it is worth emphasizing that the suboptimal results in confirmatory factor analyses and the multiple steps required to evaluate the factor structure of Cluster C PD criteria both signal problems in the current diagnostic system.

It should be observed that several Cluster C PD symptoms showed a non-simple factor structure, which was not anticipated by the *DSM-IV* model of Cluster C. In fact, variable CC values, which reflect the extent to which variables do or do not load as expected, indicating both variable convergent and discriminant validity, showed that APD criterion 4, DPD criteria 1 thru 5, and OCPD criteria 5 and 7 were not efficient indicators of the respective latent variables. This issue was particularly problematic for DPD since it involved 62.5% of the *DSM-IV* defining characteristics. Unfortunately, it is difficult to say if this occurred because APD, DPD, and OCPD represent different facets of a common higher-order factor, or rather, because some of their defining criteria are multidimensional in nature. For instance, DPD criterion 3 ("has difficulty expressing disagreement") may be related to an excessive need for dependency, as well as to an excessive fear of being criticized (APD criterion 4). In any case, these data suggest that the description of DPD criteria that is provided by the *DSM-IV* is still largely unsatisfactory as to convergent and within-cluster discriminant validity. This suggests that future editions of the *DSM* include revisions of the majority of DPD diagnostic criteria in order to differentiate the diagnosis from APD. Additionally, OCPD criteria 5 and 7 did not load on the expected latent dimension and were not efficient in discriminating the OCPD criteria latent dimension from the other two Cluster C PD criteria latent dimensions. This finding strongly suggests that future revisions of the *DSM* exclude "Is unable to discard worn-out objects" (criterion 5) and

“Adopts a miserable spending style” (criterion 7) from the list of OCPD criteria.

Finally, the pattern of factor loadings that was observed in this study was not entirely consistent with the *DSM-IV* rank order of the individual Cluster C PD criteria, which should represent their respective diagnostic efficiency for each Cluster C PD. This was particularly evident in the case of DPD, since the *DSM-IV* DPD items 8 (“fears being left to take care of him-/herself”), 6 (“feels uncomfortable when alone”), and 7 (“urgently seeks another relationship”) were the three symptoms most closely related to the DPD factor. Substantial differences with respect to the *DSM-IV* order were observed also for OCPD criteria, with “shows rigidity and stubbornness” (OCPD item 8), “is excessively devoted to work” (OCPD item 3), and “is overconscientious” (OCPD item 4) being the three best indicators of the OCPD factor. In other words, according to our findings, rigidity in behavior and morality, and inability to tolerate aloneness seem to be the main features of OCPD and DPD, respectively. Finally, in the case of APD, the pattern of factor loadings was less different from the *DSM-IV* listing than in the cases of DPD and OCPD, since “is unwilling to get involved with people” (APD item 2), “shows restraint within intimate relationships” (APD item 3), and “avoids occupational activities that involve significant interpersonal contact” (APD item 1) were the first three indicators of the APD factor. These results strongly emphasize a need for further studies on this topic in order to provide an empirical basis for a realistic rank order of the diagnostic efficiency of the individual Cluster C PD criteria, which could be included in the next revision of the *DSM*.

In our opinion, the results of this study should be considered in the light of several limitations. First, our sample was comprised of moderately ill outpatients, and was characterized by a low to moderate base rate of Cluster C PDs, which limits generalizability to other samples. Although SCID-II and PQ data were based on observer and self-report ratings, respectively, the two instruments could not be considered independent, either conceptually (they were developed by the same authors) or empirically (SCID-II questions start with the same words of the corresponding PQ item). Thus, our findings need to be replicated with different instruments, more independent than PQ and SCID-II. It is also possible that the format of the SCID-II interview may have biased the results toward a unidimensional structure, although the consistent replication of the factor analysis results using the PQ, which is characterized by a different item organization, seems to indicate that the risk of spurious findings due to the interview format is low. Finally, the sample was composed only of outpatients, which limits the generalizability of our findings to samples composed of either less or more severely ill participants.

In summary, the results of this study support the hypothesis that three dissociable PDs can be identified within the realm of the *DSM-IV* Cluster C PD symptoms across both interview and self-report data. The low specificity of several Cluster C PD symptoms and the differences observed in the rank order between the empirical pattern of factor loadings and the rank order that was expected according to the *DSM-IV* listing of criteria indicate the need for future revisions of these criteria, particularly in the case of DPD. These considerations, as well as the limitations of this study, strongly suggest the need for further studies before drawing definitive conclusions on the latent structure of *DSM-IV* Cluster C PDs.

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