Personality-Based Latent Classes of Posttraumatic Psychopathology: Personality Disorders and the Internalizing/Externalizing Model

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Abstract

Prior research using the Brief Form of the Multidimensional Personality Questionnaire (MPQ-BF; Patrick, Curtin, & Tellegen, 2002) has shown evidence of three temperament-based subtypes—termed internalizing, externalizing, and "simple PTSD"—among individuals with symptoms of posttraumatic stress disorder (PTSD; Miller, Greif, & Smith, 2003). This study sought to replicate and extend research in this area by conducting a latent profile analysis of higher-order temperament scales from the MPQ-BF using a new sample of 208 veterans with symptoms of PTSD. Results suggested that a three-class solution reflecting internalizing, externalizing, and simple subtypes of posttraumatic psychopathology provided the best fit to the data. The externalizing subtype was characterized by features of antisocial, borderline, histrionic, and narcissistic personality disorders on the International Personality Disorder Examination (Loranger, 1999) as well as low levels of constraint and high levels of negative emotionality on the MPQ-BF. In contrast, individuals in the internalizing class exhibited features of schizoid and avoidant personality disorders, low levels of positive emotionality, and high levels of negative emotionality. The simple subtype was defined by low levels of comorbid personality disorder features and relatively normal personality profiles. Findings support the reliability of this typology and support the relevance of the internalizing and externalizing model to the structure of personality disorders.

Posttraumatic stress disorder (PTSD) and the disorders that accompany it can be conceptualized as the product of traumatic stress operating on individual diatheses that span the spectrum of human variation in vulnerability to psychopathology. This interaction is

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reflected in extensive heterogeneity in the diagnostic comorbidity and personality profiles among individuals with PTSD. Recent factor analytic and twin-modeling studies suggest that variation in the form and expression of posttraumatic distress does not occur randomly, but is shaped by a definable genetic and temperament-based structure that gives rise to dimensions of comorbidity termed *internalizing* and *externalizing* (Krueger, 1999; Miller, Fogler, Wolf, Kaloupek, & Keane, 2008; Wolf, Miller, Krueger, Lyons, Tsuang, & Koenen, 2010). Evidence suggests that this diathesis-stress interaction is also manifested in personality-based internalizing and externalizing subtypes of PTSD (e.g., Forbes, Elhai, Miller, & Creamer, 2010; Flood et al., 2010; Miller, Kaloupek, Dillon, & Keane, 2004; Miller, Greif, & Smith, 2003; Miller & Resick, 2007; Rielage, Hoyt, & Renshaw, 2010; Sellbom & Bagby, 2009). Specifically, recent cluster analytic studies of the personality profiles of individuals with PTSD symptoms have shown evidence for three distinct subtypes: a low pathology or "simple PTSD" cluster defined by less severe psychiatric disturbance, and two more pathological or "complex" clusters distinguished by traits and symptoms related to externalizing versus internalizing psychopathology. Across these studies, externalizers have been characterized by low constraint (CON), high negative emotionality (NEM), and problems in the domains of anger, aggression, antisociality, and substance-related disorders. In contrast, internalizers have been defined by high NEM, low positive emotionality (PEM), and problems in the areas of depression, anxiety, social avoidance, and withdrawal.

This typology can be conceptualized as a class-quantitative model in which categories (classes) are superimposed on a dimensional organization of descriptive traits (i.e., internalizing and externalizing; cf. Skinner, 1981; Blashfield, 1993). This model is well-suited for empirical testing using latent profile analysis (LPA)—a form of latent class analysis (LCA) which identifies subgroups of categorical latent variables using observed scores from continuous variables (i.e., as opposed to categorical variables, which can be evaluated with LCA). Unlike the cluster analysis-based methods which have been used in most prior studies of the internalizing/externalizing PTSD model, LPA does not assume equal class sizes and it generates goodness-of-fit statistics that permit direct comparison of the fit of alternative models as well as conditional probability scores that provide an index of the likelihood of each case belonging to a given class. Only one prior published study has used LPA for a similar purpose. Forbes et al. (2010) analyzed Minnesota Multiphasic Personality Inventory-2 (MMPI-2) Personality Psychopathology-5 (PSY-5) scales in Australian combat veterans with PTSD and found support for a four-class solution. These classes reflected lower pathology, externalizing, and internalizing subgroups, with the internalizers divided into two classes that differed primarily in severity of disturbance (i.e., moderate versus high internalizing). Forbes et al. suggested that the three-class typology was still the most conceptually appealing model and attributed the four-class finding to high levels of psychoticism among a subset of internalizers. It is also possible that the use of LPA versus cluster analysis partially explained differences in results obtained by Forbes et al. relative to prior studies that found 3 cluster solutions.

Study Aims and Hypotheses

The first aim of this study was to use LPA to examine the heterogeneity of personality profiles of individuals with PTSD symptoms and evaluate the clinical correlates of conditional probability scores for each class. We hypothesized that a three-class solution reflecting latent internalizing, externalizing, and simple subtypes, would provide the best fit to the data, as the literature provides more support for this solution over a four-class version and because we expected qualitative, as opposed to dimensional, distinctions to emerge. We expected the internalizing subtype to be defined by high NEM and low PEM, the externalizing subtype to evidence high NEM and low CON, and the simple pathology

subtype to be associated with normal range temperament profiles. The second aim of this study was to compare the personality disorder (PD) symptom profiles of these subtypes using data from a clinical interview. Prior studies of this typology have focused primarily on problems in the domain of Axis I. One exception to this was a study by Miller and Resick (2007) that examined subtype differences on PD scales from the *Schedule for Nonadaptive and Adaptive Personality* (Clark, 1996). Results showed that externalizers endorsed more Cluster B PD features than participants in the other two groups while internalizers produced the highest scores on schizoid and avoidant PD. The "simple PTSD" cluster generated relatively low scores across the PD scales. Though suggestive of subtype differences in PD symptomatology, study conclusions were limited because the same self-report measure was used for identifying subtypes and examining their clinical correlates. The present study overcame this limitation by using the Multidimensional Personality Questionnaire-Brief Form (MPQ-BF; Patrick, Curtin, & Tellegen, 2002) to identify subtypes, and examining their differential associations with PD assessed using the International Personality Disorder Examination (IPDE; Loranger, 1999). We expected the same patterns of Axis II comorbidity reported by Miller and Resick (2007) to emerge in this study.

Method

Participants

Participants were 242 veterans who screened positive for current PTSD according to the *DSM-IV* scoring algorithm based on the PTSD Checklist administered by telephone (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). Of these, 20 were omitted from analyses because they did not participate in any diagnostic interview, were terminated by study staff, or were later found ineligible (e.g., no PTSD criterion A event), leaving a sample of 222. Participants were predominantly male ($n = 201$, 90%) and self-reported their race and ethnicity as follows: 174 (79%) White, 43 (20%) Black or African American, 16 (7.3%) American Indian or Alaskan Native, and 8 (4%) were of unknown racial origin (totals sum to greater than 100% as participants could select more than one race). In addition, 8 (4%) endorsed their ethnicity as Hispanic or Latino. The mean age was 50.8 ($SD = 10.7$, range: 23–68). From this group, 215 participants had scores on the three higher-order and validity index MPQ-BF scales and 208 produced valid MPQ-BF profiles, as defined by Patrick et al. (2002).

Procedure

Procedures involved completion of self-report measures and administration of structured diagnostic interviews by a PhD-level clinician or MA-level clinical psychology graduate student. The study took place over two sessions with individual sessions scheduled no more than one week apart.

Measures

The higher-order scales on the MPQ-BF (Patrick et al., 2002), a well-validated 155-item self-report omnibus personality inventory, were used as the primary dependent variables in the LPA. These scales index NEM, PEM, and CON and reflect weighted composites of the MPQ-BF primary trait scales. PD features were assessed with the IPDE (Loranger, 1999), a 99-item semi-structured interview developed through field trials sponsored by the World Health Organization and the National Institutes of Health. The IPDE yields both categorical/ diagnostic and dimensional scores for each PD. All IPDE interviews were digitally videotaped and approximately 30% of the full sample was scored by a second rater to assess inter-rater reliability. Kappas for Axis II diagnoses ranged from .48 to 1.0, with a mean of . 73 across diagnoses. Intraclass correlation coefficients for dimensional scores ranged from . 84 to .97 with a mean of .93 across diagnoses. The Clinician Administered PTSD Scale

(CAPS; Blake et al., 1990), a gold-standard structured interview for the assessment of PTSD, was also administered. This interview was also videotaped and 30% of the full sample's tapes were independently coded by a second rater yielding an intraclass correlation coefficient for dimensional scores of $r = .93$ and a kappa of .61 for the diagnostic determinations.

Statistical Analyses

We conducted the LPA on the raw scores of the three higher-order scales of the MPQ-BF and compared the fit of competing models (i.e., 2, 3, and 4 class solutions). Specifically, we evaluated the Bayesian information criterion (BIC; Schwartz, 1978), a statistical information criterion that is designed to balance fit with parsimony such that it will select models that maximize fit while minimizing the number of parameters. It has been shown to perform well in simulation studies evaluating model selection (Nylund, Asparouhov, & Muthén, 2007). With this statistic, lower values indicate better fit, with a 10-point difference suggestive of meaningful improvement in model fit (Raftery, 1995). We also evaluated the bootstrap likelihood ratio test (BLRT; McLachlan & Peel, 2000), which compares the fit of the specified model with a null model containing one fewer classes. A recent simulation study suggested that this fit statistic was highly accurate in its ability to inform model selection (Nylund et al., 2007); with this statistic, a p-value < .05 indicates that there is significant improvement in the fit in the specified model relative to the model with one less class. We also evaluated the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-A; Lo, Mendell, & Rubin, 2001). This statistic is evaluated in a manner similar to the BLRT but is less consistent in its ability to identify the correct class solution than the BLRT (Nylund et al., 2007). We also report the loglikelihood and entropy values for each solution. The LPA was conducted with the Mplus 5.2 statistical modeling software (Muthén & Muthén, 1998–2009) using the robust maximum likelihood estimator (MLR). After determining the optimal model solution, conditional probabilities for each participant were estimated via Mplus and used in evaluating mean differences in MPQ-BF traits and IPDE severity scores using one-way ANOVAs with class membership as the between-subjects variable. To reduce the risk of type I error associated with a large number of statistical tests, we adjusted the p-value required to achieve statistical significance for the overall ANOVA (as detailed below). Pairwise comparisons were evaluated using post-hoc testing with Tukey HSD. We also evaluated the pattern of correlations between each participant's conditional probability of class membership and dimensional scores on the MPQ-BF and IPDE.

Results

Rates of Psychopathology

Prevalence rates for current diagnostic levels of *DSM-IV* Axis II disorders were: 6.3% paranoid PD; 3.9% schizoid PD; 5.3% schizotypal PD; 9.7% antisocial PD; 3.4% borderline PD; .5% histrionic PD; 2.4% narcissistic PD; 8.3% avoidant PD; .5% dependent PD; and 8.7% obsessive-compulsive PD. In total, 31.1% of the sample met diagnostic criteria for one or more PD. Fifty-six percent of the sample met criteria for current PTSD, as assessed by the CAPS.

Latent Profile Analysis

Table 1 shows the fit statistics for the 2, 3, and 4-class solutions that were evaluated. The LMR-A and BLRT p-values suggested that the 3-class model yielded improved fit relative to a 2-class model. The 4-class model did not provide further improvement relative to a 3-class model: the p-values associated with the LMR-A and BLRT statistics were both greater than .05. Further, the BIC value for the 4-class solution was nearly 10 points greater than that of the 3-class solution, suggesting the superiority of the 3-class model. In addition to

out-performing the other models in terms of relative model fit, the 3-class model evidenced good mean latent class probabilities for each individual's most likely class membership (mean for class 1 = .94, for class 2 = .82, and for class 3 = .79), suggesting that individuals were well classified. In total, 68% of cases were classified into class 1, 18% into class 2, and 14% into class 3.

ANOVAs

We next imported the latent conditional probabilities estimated by Mplus into SPSS and used final class membership as a between-subjects variable in ANOVAs evaluating mean differences in MPQ-BF profiles and PD severity scores. The *p*-value necessary to obtain statistical significance on the overall *F*-test associated with each family of tests (i.e., MPQ-BF and IPDE) was adjusted using the procedure described by Holm (1978); Figure 1 displays mean T-scores on the MPQ-BF as a function of latent class. Overall *F*-tests were significant for all MPQ–BF scales with the exception of the Traditionalism scale (exact statistics available from first author). Class 1 scored lowest on all scales related to PEM and high on measures of NEM. Class 2 evidenced mean scores that fluctuated around the normal range (i.e., T = 50). Class 3 scored equally high as did Class 1 on Stress Reaction, but had higher mean scores on Aggression and Alienation than Class 1, and lower mean scores on Control and Harm Avoidance than either of the other classes. Based on this pattern of results, Class 1 was identified as the internalizing group, Class 2 as the simple pathology group, and Class 3 as the externalizing group.

We next evaluated group differences in raw severity scores on the IPDE. Six percent of cases were missing IPDE data. Overall *F*-tests were statistically significant for the Schizoid, Antisocial, Borderline, Narcissistic, Histrionic and Avoidant PD scales and were further evaluated with pairwise comparisons (exact statistics available from first author). As shown in Figure 2, internalizers scored higher than externalizers on schizoid PD (and the pairwise comparisons suggested a statistical trend for internalizers to also score higher than externalizers on avoidant PD) whereas externalizers scored higher than internalizers on all Cluster B PDs. We also used ANOVA to evaluate potential differences in PTSD severity among the three groups. The overall *F*-test was significant and pairwise comparisons showed that the internalizing (M = 57.79, SD = 25.22) and externalizing (M = 56.24, SD = 23.48) groups did not differ from one another on current PTSD severity, but both groups evidenced higher mean scores on the CAPS relative to the simple pathology group (M = 41.29, SD = 23.39).

Correlations

Finally, we evaluated the contribution of the MPQ-BF and IPDE severity scores to the composition of the latent classes by examining the Pearson correlations between conditional class probability and personality and PD scores. These results are shown in Table 2. Probability of membership in the internalizing class was associated with Stress Reaction and, inversely, with all PEM-based scales. In contrast, probability of membership in the externalizing class was positively associated with Alienation and Aggression and negatively associated with Control and Harm Avoidance. Probability of membership in the internalizing class was also associated with schizoid and avoidant PD while probability of membership in the externalizing class showed associations with all Cluster B PDs.

Discussion

The aim of this study was to use a new analytic approach to evaluate personality-based subtypes of posttraumatic psychopathology and to test for differences in Axis II disorders as a function of latent subtype. A LPA was conducted on the higher-order temperament traits

PEM, NEM, and CON, which yielded support for a 3-class solution. These three classes reflected internalizing, externalizing, and simple subtypes of posttraumatic response, replicating prior cluster analytic work (Sellbom & Bagby, 2009; Miller et al., 2003, 2004; Miller & Resick, 2007). As with prior studies, NEM, PEM, and CON distinguished between the classes, with the internalizing subtype marked by high NEM (particularly Stress Reaction) and low PEM, while the externalizing class was marked by high NEM and low CON. Similarly, correlations between temperament scales and conditional probability of class membership suggested that NEM and CON contributed to the within-class ranking of the probability of being in the externalizing class while PEM and Stress Reaction contributed to the within-class ranking of the probability of being in the internalizing class. Unlike cluster analysis, the use of LPA allowed for the evaluation of the relative and absolute fit of competing models, thereby providing a more stringent test of the validity of these subtypes. The only other study to use LPA to evaluate personality-based subtypes of posttraumatic psychopathology (Forbes et al., 2010) found that four classes (simple, externalizing, and moderate and high internalizing) yielded the optimal solution. The two internalizing classes differed with respect to symptom severity and as a function of psychoticism, which was associated with the high internalizing class. The MPQ-BF does not include a psychoticism-like construct and this difference in scale composition may explain the somewhat different solutions obtained in the two studies.

Other studies examining latent classes of posttraumatic response have evaluated measures of PTSD symptoms and provided evidence for subtypes that differed primarily on symptom severity (Breslau, Reboussin, Anthony, & Storr, 2005; Chung & Breslau, 2008). One strength of this study is that it demonstrates how LPA can be used to identify latent subtypes that are qualitatively distinct with respect to patterns of comorbidity. In fact, this study found that the internalizing and externalizing subtypes did not differ with respect to PTSD severity, suggesting that the subtypes are not simply a misconstrued dimensional phenomenon. Further support for the discriminant validity of the internalizing and externalizing subtypes comes from evaluation of the correlations between the conditional probabilities for these classes and the MPQ-BF primary trait scales. For example, Stress Reaction showed a specific relationship with the internalizing class whereas Aggression showed specificity for the externalizing class, as would be expected.

This study is the first to demonstrate internalizing and externalizing subtype differences in Axis II comorbidity using an independent, interview-based measure of PD. Cluster B PD features were more prevalent among the externalizing class while features of schizoid and avoidant PD were more prevalent in the internalizing class. This replicates initial work in this area (Miller & Resick, 2007), but provides stronger evidence for these associations because of improvements in the measurement of PD and in the analytic approach used in this study. Together, these findings provide support for the relevance of the internalizing/externalizing model of psychopathology to the domain of Axis II, consistent with theory (Krueger, 2005) and emerging research (Kendler et al., 2011; Markon, 2010; Wolf, Miller, & Brown, in press) suggesting that the same temperament-based latent psychopathology dimensions give rise to disorders across the axes. Such findings raise questions about the current split between Axis I and II in the *DSM-IV* and suggest that it may be more valid to group disorders on the basis of their common elements (i.e., their alignment with internalizing or externalizing) rather than to artificially separate them on different axes. Across analyses, only schizotypal, dependent, and obsessive-compulsive PD failed to show discrimination between any of the classes. This suggests that these disorders may not be well captured by this temperament-based model of comorbidity and that other factors not evaluated in this study, (e.g., cognitive functioning), may underlie their comorbidity with PTSD.

Limitations and Conclusion

The findings of this study should be considered in light of its limitations. First, this study included mostly male veterans who screened positive for PTSD, which raises questions about the generalizability of these findings to non-veterans and to women. Second, the relatively small percentage of externalizers identified in this study (14% of the sample) means that estimates of externalizing psychopathology are based on a small number of participants who may not adequately represent the broader externalizing population. However, this appears to be a consistent finding, as the externalizing subtype is typically the smallest relative to the other clusters (Miller et al., 2003; Miller & Resick, 2007). Third, the majority of participants did not meet diagnostic criteria for a PD, potentially limiting the applicability of these findings to threshold-cases of PD; this concern is offset by our use of a dimensional measure of PD severity, which yielded sufficient variability and has the advantage of providing more information for analytic purposes than does a dichotomous variable.

In conclusion, the replication of internalizing and externalizing subtypes of posttraumatic response across samples, measures of personality, and analytic approaches suggests that this organization of posttraumatic psychopathology is a robust phenomenon. It speaks to the broad associations between PTSD and both internalizing and externalizing psychopathology and calls into question the placement of PTSD among the anxiety disorders, as this location may not adequately reflect the heterogeneity of posttraumatic psychopathology. We believe it is important to represent this variation because internalizing and externalizing subtypes may be rooted in distinct genetic and biological mechanisms and require different approaches to optimize treatment.

Acknowledgments

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MPQ-BF Profiles by Latent Class
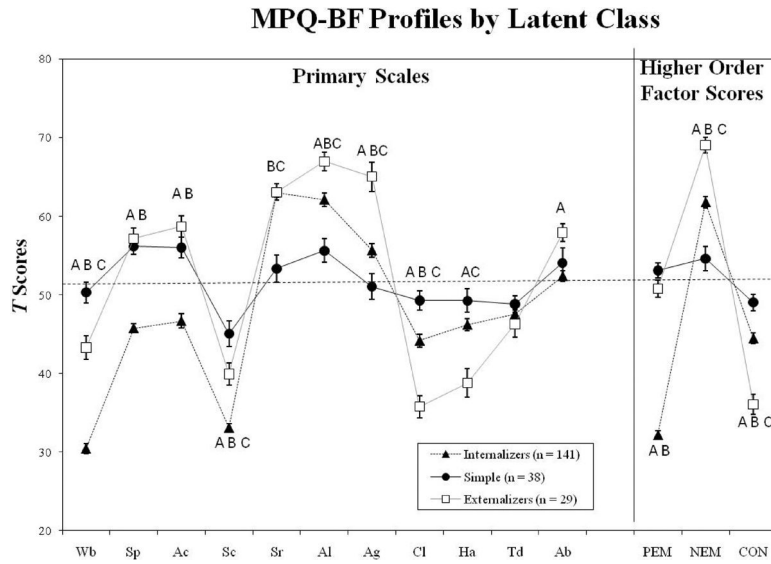
Figure 1.

Note. Letters above or below the mean values denote the results of post-hoc pairwise comparisons where A = internalizing and externalizing group means differ significantly; B = internalizing and simple group means differ significantly; and C = externalizing and simple group means differ significantly. MPQ-BF = Multidimensional Personality Questionnaire-Brief Form; Wb = Well Being; Sp = Social Potency; Ac = Achievement; Sc = Social Closeness; Sr = Stress Reaction; Al = Alienation; Ag = Aggression; Cl = Control; Ha = Harm Avoidance; Td = Traditionalism; Ab = Absorption; PEM = positive emotionality; NEM = negative emotionality; CON = constraint.

IPDE Profiles by Latent Class
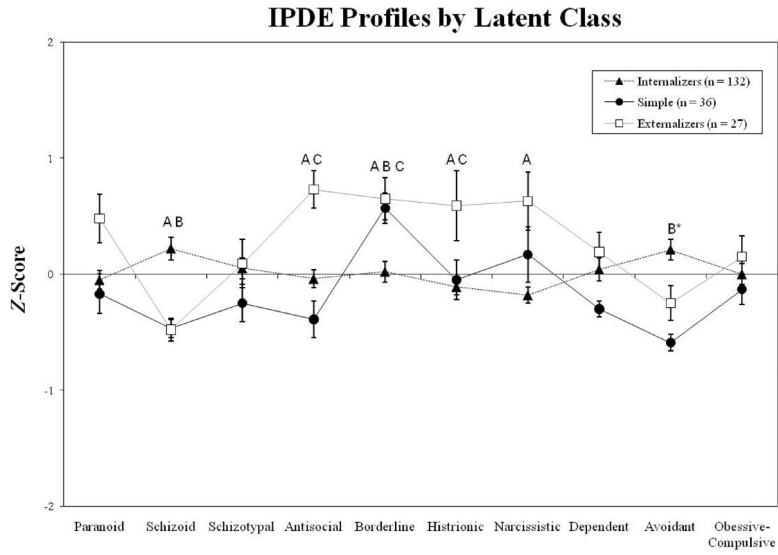
Figure 2.

Note. Letters above or below the mean values denote the results of post-hoc pairwise comparisons where A = internalizing and externalizing group means differ significantly; B = internalizing and simple group means differ significantly; and C = externalizing and simple group means differ significantly. IPDE = International Personality Disorder Examination. *The pairwise comparison also indicated a statistical trend ($p = .06$) for internalizers > externalizers.

Table 1

Fit Statistics for Latent Profile Analyses

Model	Loglikelihood	BIC	Entropy	LMR-A *p*-value	BLRT *p*-value
2 Class	−2599.00	5251.37	.77	.004	<.001
3 Class	−2591.16	5257.04	.76	.04	<.001
4 Class	−2584.71[a]	5265.50	.72	.21	.07

Note. BIC = Bayesian information criterion; LMR-A = Lo-Mendell-Rubin adjusted likelihood ratio test; BLRT = bootstrap likelihood ratio test.

[a]The best loglikelihood value was not replicated in this analysis, despite increasing the number of random starts. This is consistent with a solution that has reached a local maximum and often indicates that too many classes have been extracted.

Table 2

Correlations Among Conditional Class Probabilities, MPQ-BF Traits, and IPDE Severity Scores

Measure	C. Prob. 1 (INT)	C. Prob. 2 (Simple)	C. Prob. 3 (EXT)	Correlation Comparison
MPQ-BF				
Well Being	−.78	.70	.39	A, B, C
Social Potency	−.67	.47	.49	A, B
Achievement	−.50	.33	.38	A,B
Social Closeness	−.58	.55	.26	A, B, C
Stress Reaction	.33	−.52	.09	A, B, C
Alienation	.07	−.28	.23	B, C
Aggression	−.06	−.23	.35	A, C
Control	.07	.26	−.41	A, C
Harm Avoidance	.12	.18	−.39	A, C
Traditionalism	−.04	.12	−.07	D
Absorption	−.22	.04	.29	A, B, C
PEM	−.91	.72	.56	A, B, C
NEM	.04	−.37	.36	A, B, C
CON	.10	.30	−.50	A, C
IPDE				
Paranoid	−.04	−.09	.16	C
Schizoid	.34	−.26	−.23	A, B
Schizotypal	.08	−.10	.00	D
Antisocial	−.06	−.19	.32	A, C
Borderline	.06	−.26	.22	B, C
Histrionic	−.18	.03	.25	A, C
Narcissistic	−.28	.08	.33	A, B, C
Dependent	.06	−.12	.06	D
Avoidant	.32	−.30	−.14	A, B
OCPD	.00	−.05	.06	D

Note. Evaluation of the statistical significance of the difference in the magnitude of pairs of correlations was conducted using *t*-tests to compare dependent correlations. A = correlation coefficients associated with INT versus EXT are significantly different; B = correlation coefficients associated with INT versus simple are significantly different; C = correlation coefficients associated with EXT versus simple are significantly different; D = No significant differences between any pair of correlations in the row. C. Prob = conditional probability of class membership; INT = internalizing; EXT = externalizing; MPQ-BF = Multidimensional Personality Questionnaire-Brief Form; IPDE = International Personality Disorder Examination; PEM = positive emotionality; NEM = negative emotionality; CON = constraint; OCPD = obsessive-compulsive personality disorder.