BRIEF REPORTS

Factor Structure of the Psychopathic Personality Inventory (PPI): Findings From a Large Incarcerated Sample

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Exploratory factor analysis (EFA) of the Psychopathic Personality Inventory (PPI; S. O. Lilienfeld, 1990; S. O. Lilienfeld & B. P. Andrews, 1996) with a community sample has suggested that the PPI subscales may comprise 2 higher order factors (S. D. Benning, C. J. Patrick, B. M. Hicks, D. M. Blonigen, & R. F. Krueger, 2003). However, substantive and structural evidence raises concerns about the viability of this 2-factor model, particularly in offender populations. The authors attempted to replicate the S. D. Benning et al. 2-factor solution using a large ($N = 1,224$) incarcerated male sample. Confirmatory factor analysis of this model resulted in poor model fit. Similarly, using the same EFA procedures as did S. D. Benning et al., the authors found little evidence for a 2-factor model. When they followed the recommendations of J.-W. van Prooijen and W. A. van der Kloot (2001) for recovering EFA solutions, model fit results provided some evidence that a 3-factor EFA solution could be recovered via confirmatory factor analysis.

Keywords: psychopathy, self-report, factor analysis, structure, offenders

Psychopathy is a personality disorder that can be characterized by a constellation of interpersonal and affective traits coupled with impulsive and antisocial tendencies (Hare & Neumann, 2006). An emerging area of research, though not without significant methodological challenges (Lilienfeld & Fowler, 2006), involves self-report assessment of psychopathy. Lilienfeld (1990) and Lilienfeld and Andrews (1996) used a series of college student samples to develop the Psychopathic Personality Inventory (PPI), a theoretically grounded self-report instrument intended to assess a range of psychopathic traits. The PPI yields a total score and eight factor analytically derived subscales (Stress Immunity, Social Potency, Fearlessness, Coldheartedness, Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, Carefree Nonplanfulness) that are theorized to represent components of psychopathy. Studies have suggested that it is a reliable and valid instrument (Lilienfeld & Andrews, 1996; Poythress, Edens, & Lilienfeld, 1998), though most studies have been done with nonoffender samples.

Despite the increasing popularity of the PPI, its factor structure has not been fully elucidated. Although factor analytic research sometimes reveals more about an instrument than an underlying construct, structural studies can help uncover PPI dimensions linked to the psychopathy construct. For instance, the understanding of normal-range personality is due in large part to structural research (Hare & Neumann, in press). Also, use of an invalid factor solution could lead to misuse of the PPI (e.g., improper scale composites), which could impede future research.

Using a community sample of 353 individual male twins and a series of exploratory factor analyses (EFAs), Benning, Patrick, Hicks, Blonigen, and Krueger (2003) selected a two-factor solution to account for PPI subscale covariation. The PPI–I factor was represented by the Stress Immunity, Social Potency, and Fearlessness subscales, and the PPI–II factor (the first factor to emerge) was represented by the Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, and Carefree Nonplanfulness subscales. In an attempt to provide evidence of the stability of the two-factor PPI structure, Benning, Patrick, Salekin, and Leistico (2005) factor analyzed the PPI subscales using an undergraduate sample and suggested that, compared with the final factor loadings described in Benning et al. (2003), "The two factor structures are essentially equivalent" (p. 276).

In both of these PPI EFA studies, the Fearlessness subscale substantially cross-loaded onto the PPI–II factor, thereby limiting confidence in a clean two-factor structure. Also, each study found that the Stress Immunity subscale, to a lesser extent, cross-loaded onto the PPI–II factor. Furthermore, examination of the EFA results in Lilienfeld's (1990) dissertation (see Appendix) reveals a two-factor solution in which the Fearlessness subscale substantially cross-loads onto both PPI factors, as does the Impulsive Nonconformity subscale. Taken together, one may reasonably expect that a stringent confirmatory factor analysis (CFA) of the Benning et al. (2003) two-factor PPI model would not show good model fit. This expectation is consistent with factor analytic research by van Prooijen and van der Kloot (2001) that has highlighted the challenges of confirming factor solutions when notable cross-loadings are present.

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The Benning et al. studies (2003, 2005) are also significant in that the Coldheartedness subscale was not included as part of the final factor solution. At least conceptually, the Coldheartedness subscale is intimately tied to the construct of psychopathy and has been found to be empirically associated with the Hare Psychopathology Checklist—Revised (PCL–R; Poythress et al., 1998). Recently, Patrick, Edens, Poythress, Lilienfeld, and Benning (2006) indicated in a footnote that the factor structure of the PPI with an offender sample consisted of two dominant factors that were consistent with the results of Benning et al. (2003). However, the authors did not report the pattern of factor loadings, and it appears that the Coldheartedness subscale was eliminated from the model as well.

Potentially, the factor structure identified by Benning et al. (2003), on the basis of a community sample, may not be similar to the structure of the PPI in incarcerated samples. However, given that psychopathy appears to be a construct that is continuously distributed (e.g., Guay, Ruscio, Knight, & Hare, 2007; Marcus, John, & Edens, 2004), one may reasonably expect some uniformity of PPI factor solutions across nonincarcerated and incarcerated populations. Moreover, other psychopathy research has found similar factor structures across very diverse samples (Hare & Neumann, in press). Additional structural research on the PPI with offenders would be advantageous, given the relatively high level of psychopathic traits in these populations. Therefore, we conducted the current study to investigate whether the final two-factor PPI model selected by Benning et al. (2003) could be confirmed using both CFA and EFA with a large offender sample.

Method

Participants

The sample consisted of 1,224 adult males (54% Caucasian, 43% African American, 3% Other) who ranged in age from 18 to 45 years ($M = 29.14$, $SD = 7.424$) and were incarcerated in one of three Wisconsin state prisons. The data that were pooled was collected from individuals in minimum security ($n = 388$), maximum security ($n = 496$), and a maximum-security prison reception center ($n = 340$). Researchers identified participants from a comprehensive roster and screened files to eliminate individuals who were older than 45 years of age, had diagnoses of bipolar disorder or schizophrenia, or were currently using psychotropic medication. Participants received both oral and written consent to procedures and were informed that participating or refusing to participate would have no impact on their correctional status.

PPI

The PPI (Lilienfeld, 1990; Lilienfeld & Andrews, 1996) is a 187-item self-report instrument designed to "provide a relatively pure measure of the personality-based approach to psychopathy" (Lilienfeld & Andrews, 1996, p. 492) that is devoid of any items indexing antisocial behaviors. Respondents answer questions using a 4-point Likert scale (1 = *false*, 2 = *mostly false*, 3 = *mostly true*, 4 = *true*). The PPI yields a total psychopathy score and eight lower order subscales that reflect personality dimensions associated with psychopathy. The PPI total score has demonstrated adequate internal consistency and test–retest reliability in under-

graduate and prison samples (Lilienfeld & Fowler, 2006). In the present study, Cronbach's alpha was .91 for PPI total score, and the PPI subscales ranged from .73 (Stress Immunity) to .87 (Machiavellian Egocentricity). The majority of the subscales were at or above .80. Mean interitem correlations for the subscales ranged from .21 (Fearlessness) to .15 (Impulsive Nonconformity), with most subscales falling slightly below .20.

Data Analytic Plan

First, descriptive statistics and correlations were computed for the PPI subscales. Next, using the total sample, we tested the two-factor solution highlighted by Benning et al. (2003) via CFA by setting the respective PPI subscales to load onto one of two PPI factors.[1] Specifically, the Stress Immunity, Social Potency, and Fearlessness subscales were set to load on a PPI–I factor, whereas the Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, and Carefree Nonplanfulness subscales were set to load on a separate PPI–II factor. The PPI factors were allowed to correlate freely, though an orthogonal association between factors was also tested. We used the robust maximum likelihood procedure provided by EQS (Version 5.6; Bentler, 1995) to estimate model parameters and cope with any departure from multivariate normality. Model fit was gauged through use of conventional model fit indices provided by EQS (i.e., robust comparative fit index [RCFI], Tucker–Lewis Index [TLI], root-mean-square error of approximation [RMSEA], and standardized root mean square [SRMR]). Third, we used the same EFA procedures reported by Benning et al. (2003) to conduct a series of EFAs. Finally, as demonstrated by van Prooijen and van der Kloot (2001), a viable strategy to employ when one is trying to recover an EFA solution via CFA is to fix the variable-to-factor loadings to the exact values obtained in the original EFA. Thus, we used all factor loading values (both low and high) from the EFA solution that accounted for the most variance and also used this approach to test the Benning et al. (2003) two-factor solution.

Results and Discussion

Descriptive statistics are provided in Table 1. Several of the PPI subscales evidenced significant skew and kurtosis. Notably, the same general distribution patterns persisted when cases with significant elevations on any of the three PPI validity subscales (~10%) were eliminated. Comparison of the current PPI subscale descriptives with those reported in a community study of twins

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[1] As discussed by many experts (Tomarken & Waller, 2005), confirmatory factor analysis (CFA) is an optimal procedure to use when one is statistically testing specific models while also controlling for measurement error. We did not rely on congruence coefficients to compare our EFA results with those of Benning et al. (2003), given that (a) exclusive use of this method has been criticized (Floyd & Widaman, 1995) and, more important, that (b) CFA performs just as well as does the older method of computing congruence coefficients when large samples are employed (see Aluja, Garcia, Garcia, & Seisdedos, 2005, for a comparison of congruence coefficients and CFA, as well as a discussion of the limitations of McCrae, Zonderman, Costa, Bond, & Paunonem, 1996). Using the procedures discussed by van Prooijen and van der Kloot (2001), we attempted to recover the EFA solution that accounted for the most common variance of the PPI subscales via CFA.

Table 1
Descriptive Statistics for PPI Subscales: Total Sample (N = 1,224)

Subscale	Min	Max	*M*	*SD*	Skewness (*SE*)	Kurtosis (*SE*)
Impulsive Nonconformity	17	64	37.50	8.18	.353 (.070)	−.012 (.140)
Blame Externalization	18	70	43.74	9.48	−.140 (.070)	−.443 (.140)
Machiavellian Egocentricity	30	117	69.58	14.31	−.028 (.070)	−.037 (.140)
Carefree Nonplanfulness	20	72	38.44	9.37	.726 (.070)	.627 (.140)
Stress Immunity	16	44	31.66	5.53	−.040 (.070)	−.404 (.140)
Social Potency	33	94	64.99	10.59	−.201 (.070)	−.030 (.140)
Fearlessness	21	76	48.67	10.78	.031 (.070)	−.527 (.140)
Coldheartedness	24	81	47.19	9.56	.659 (.070)	.788 (.140)

Note. PPI = Psychopathic Personality Inventory.

revealed little difference in PPI profile elevations (Blonigen, Carlson, Krueger, & Patrick, 2003). Curiously, few studies have reported PPI subscale descriptive statistics.

Zero-Order Correlations

Table 2 presents the zero-order correlations between the PPI subscales. The pattern of these observed (manifest) correlations may assist in identification of the underlying or latent structure of the PPI subscales. The pattern of correlations is not what one would expect if the Benning et al. (2003) two-factor model were correct. The Carefree Nonplanfulness subscale was modestly associated with most of the subscales that form the PPI–II factor, and the subscales that make up the PPI–I factor did not display strong intercorrelations. Also, the Fearlessness subscale showed substantial associations with two of the subscales that represent the PPI–II factor (Impulsive Nonconformity, Machiavellian Egocentricity). This latter result is consistent with the cross-loading that the Fearlessness subscale showed on the PPI–II factor in both Benning et al. (2003, 2005) studies, as well as in Lilienfeld (1990; see Appendix). Finally, the correlation between Carefree Nonplanfulness and Coldheartedness suggests a meaningful relation between these two subscales.

CFA Rresults for the Benning et al. (2003) Model

Table 3 displays the standardized loadings for the CFA of the Benning et al. (2003) two-factor PPI model. Several PPI subscales had suboptimal factor loadings. Also, the statistical test of the Benning et al. model resulted in a misspecified model (i.e., a lower bound error for the Social Potency PPI subscale error term). In other words, EQS estimated this error variance as a negative parameter. Fit indices for the Benning et al. model were poor, $\chi^2(13, N = 1,224) = 1,117.18$, CFI = .487, TLI = .171, RMSEA = .264, 90% confidence interval = 250–277, SRMR = .205. The PPI factors correlated at $r = .26$, $p < .01$.[2]

Exploratory Factor Analysis: Attempt to Replicate Benning et al. (2003)

Given that the CFA performed on the sample did not support the factor structure reported by Benning et al. (2003), we attempted to identify a factor structure that would best summarize the current data. Consistent with Benning et al., we used the eight PPI subscales for principal-axis factor analysis with varimax rotation. See

Table 4 for results. This initial EFA resulted in extraction of three PPI factors (eigenvalues > 1) that accounted for 56% of the variance. The first factor accounted for 26% of the variance, whereas the second and third accounted for similar, lesser proportions of the variance (17% and 13%). The first factor consisted primarily of four PPI subscales: Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, and Fearlessness. The second factor consisted primarily of the Stress Immunity and Social Potency subscales. The third factor consisted of Coldheartedness and Carefree Nonplanfulness.

To stay consistent with Benning et al. (2003), we conducted additional EFAs, which involved (a) restricting the EFA to a two-factor solution and (b) dropping the Coldheartedness subscale. For Factor A of the first supplementary EFA, the two PPI factors accounted for 42% of the variance (27% and 15%, respectively). It is notable that the pattern of results matches very closely the two-factor EFA reported by Lilienfeld (1990) in the Appendix. Finally, for Factor B of the EFA, two PPI factors emerged that accounted for 46% of the variance (29% and 17%, respectively). Overall, the results do not reveal a clear two-factor solution in line with that found by Benning et al.

Model Recovery of Three-Factor EFA Via CFA

Following the recommendations of van Prooijen and van der Kloot (2001), we attempted to recover our three-factor EFA solution via CFA by using the exact factor loadings from this solution to fix the loadings of the CFA. Doing this provided us with a statistical metric of the quality of the EFA solution. Because this EFA solution accounted for the majority of the variance in the PPI subscales, this was the optimal solution for recovery. The modeling results were mixed. Fit was good in terms of one absolute fit index (SRMR), and one incremental fit index (CFI) was at an adequate fit level. The fit indices were as follows: $\chi^2(22, N =$

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[2] Consistent with standard recommendations (Bentler, 1995), the initial CFA was based on analysis of the PPI subscales covariance matrix. However, there was no substantial difference in model fit when the CFA model was tested with the correlation matrix of PPI subscale scores or with orthogonality between factors specified. Also, the same pattern of results was obtained when cases with PPI validity subscales elevations were excluded.

Table 2
Manifest Variable PPI Subscale Correlations: Total Sample (N = 1,224)

Subscale	1	2	3	4	5	6	7	8
1. Impulsive Nonconformity	—	**.39**	**.54**	**.32**	−.17	.12	.56	.04 (*ns*)
2. Blame Externalization		—	**.50**	**.09**	−.39	.00 (*ns*)	.24	−.17
3. Machiavellian Egocentricity			—	**.29**	−.31	.28	.39	.14
4. Carefree Nonplanfulness				—	−.34	−.25	.15	.41
5. Stress Immunity					—	*.39*	*.00 (ns)*	.19
6. Social Potency						—	*.24*	.01 (*ns*)
7. Fearlessness							—	−.05 (*ns*)
8. Coldheartedness								—

Note. Psychopathic Personality Inventory (PPI) subscales are ordered by factor designation on the basis of Benning et al.'s (2003) exploratory factor analysis solution. We have used bold and italicized correlations, respectively, to help designate within-subscale correlations for the proposed PPI–II and PPI–I factors. All correlations were significant at *p* < .05 or less, unless otherwise noted.

1,224) = 361.55, CFI = .900, TLI = .864, RMSEA = .112, SRMR = .044.[3]

In sum, the findings did not support the two-factor PPI subscale model derived by Benning et al. (2003). Model fit indices were poor when the model was tested in terms of a strict two-factor model (i.e., PPI subscales were specified to load on only one of two latent factors), and the EFA results did not conform to this model. Patrick et al. (2006) suggested that they had been able to replicate the Benning et al. (2003) model using a relatively moderately sized sample of offenders (*N* = 302), though the factor loadings were not reported and they did not conduct a rigorous CFA test of the two-factor model.

As discussed previously, we do not think there are fundamental differences between community and offender samples that could jeopardize identification of a common PPI model. Indeed, the close approximation of our two-factor EFA results with Lilienfeld's (1990) results supports our contention. One reason for obtaining poor fit for a two-factor model is that it could not adequately reproduce the sample PPI covariance matrix, as evidenced by the large SRMR. The pattern of subscale correlations also is not consistent with a two-factor model. Given that other psychopathy measures reflect at least four correlated factors (Hare & Neumann, in press; Larsson et al., 2007; Williams, Paulhus, & Hare, 2007), we suggest that more than two dimensions will be necessary to fully elucidate the nature of the PPI-based psychopathy construct.[4]

Table 3
Confirmatory Factor Analysis of Benning et al. (2003) Two-Factor PPI Model (N = 1,224)

Subscale	PPI–I	PPI–II	Error/unique variance
Impulsive Nonconformity		0.604	.797
Blame Externalization		0.542	.840
Machiavellian Egocentriciy		0.928	.372
Carefree Nonplanfulness		0.311	.951
Stress Immunity	0.389		.921
Social Potency	1.000		.000 (*ns*)
Fearlessness	0.237		.971

Note. All factor loadings and error variance terms were significant (*p*s < .05–.001), unless otherwise indicated. PPI = Psychopathic Personality Inventory.

The current results suggest that there is notable overlap among the PPI subscales. In particular, the PPI–I Fearlessness subscale was significantly linked to the subscales that make up the Benning et al. (2003) PPI–II factor. Also, both the three- and two-factor EFA solutions indicated that fearlessness, impulsive nonconformity, blame externalization, and machiavellian egocentricity constituted a single broad factor. Similar EFA findings are evident in the Benning et al. (2003, 2005) PPI studies and Lilienfeld (1990). Taken together, this broad PPI factor might be referred to as fearless impulsive antisociality.

Across all EFA solutions, in both current and previous studies, the Stress Immunity and Social Potency subscales held together and may constitute a second factor, which perhaps reflects high extroversion and low neuroticism (Derefinko & Lynam, 2006). Last, Coldheartedness had a complex relationship with the other PPI subscales but was primarily associated with Carefree Nonplanfulness; these two subscales appear to constitute a third (callous–indifferent) factor.

The current study provides further research on self-report of psychopathic traits in offenders. This is an important endeavor, as the PPI could be used as a common metric across community and

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[3] We also employed the van Prooijen and van der Kloot (2001) technique to further test the Benning et al. (2003) two-factor model. Thus, we used the exact loading values obtained from our two-factor EFA (without coldheartedness) to fix the loadings of the CFA. Although this model resulted in some improved fit from the more stringent test of this model, $\chi^2(18, N = 1,224) = 424.63$, CFI = .871, TLI = .850, RMSEA = .132, SRMR = .060, it still did match the degree of fit of the three-factor CFA model.

[4] On the other hand, if the PPI were to be modeled at the item level, one could possibly model all eight subscales in terms of separable latent dimensions. Yet, modeling the 160 items that make up these subscales remains a considerable challenge. One way to parse the complexity of the PPI is to examine the items at differing levels of disaggregation. It is possible to model some constructs at the item level (completely disaggregated model) versus composites of item subsets (partially disaggregated model). However, it is essential that such aggregated or parceled variables be understood in terms of the interitem relations that make up a parcel and that the parceled items represent a unidimensional latent variable (e.g., Neumann, Kosson, Forth, & Hare, 2006; Neumann, Hare, & Newman, 2007). Use of multidimensional item sets within a parcel usually results in model misspecification (Bandalos, 2002).

Table 4
Results of EFA Using Principal-Axis Factor Analyses of PPI Subscales (N = 1,224)

Subscale	Three-factor solution			Two-factor solution		Two-factor solution without Coldheartedness	
	A	B	C	A	B	A	B
Impulsive Nonconformity	**.750**	−.015	.146	**.707**	**.310**	**.759**	−.108
Blame Externalization	**.570**	−.278	−.197	**.570**	−.008	**.500**	−.282
Machiavellian Egocentricity	**.774**	−.058	.127	**.748**	.275	**.781**	−.144
Carefree Nonplanfulness	*.259*	**−.403**	**.733**	**.425**	−.173	*.261*	**−.411**
Stress Immunity	−.271	**.846**	.091	**−.593**	**.641**	−.199	**.768**
Social Potency	.292	**.572**	−.101	−.010	**.650**	**.342**	**.625**
Fearlessness	**.601**	*.157*	.031	**.473**	**.407**	**.613**	*.107*
Coldheartedness	−.022	.141	**.653**	.030	.080		

Note. Factor loadings ≥ .30 are in boldface. Those that differ from factor loadings in Benning et al. (2003) are underlined. Boldface plus underlined results are *unexpected* strong loadings, and italicized plus underlined results are *expected* strong loadings. EFA = exploratory factor analysis; PPI = Psychopathic Personality Inventory.

offender populations. However, an inevitable fact of studying extreme samples (e.g., offender, psychiatric) is that the data will usually show substantial departures from normality. Thus, we relied upon robust estimation procedures to help counter skewed and kurtotic data. A more central concern in using the PPI involves the validity of the responses. A small percentage of cases in the current study had deviant response styles. Nevertheless, our results remained essentially unchanged when those cases with elevations on the PPI validity scales were not included in the analyses. As discussed by Lilienfeld and Fowler (2006), the responses of individuals to the PPI questions may or may not be veridical, but they nonetheless provide "helpful information regarding respondents' apperceptions of themselves and the world" (p. 111). In this sense, delineation of the latent structure of the PPI may lead to better understanding of the nature of self-reported psychopathic traits in offenders.

In terms of additional research on the PPI subscales, one avenue to pursue is that advocated by Lynam and Widiger (2007), whereby the basic elements of psychopathy are identified by embedding the construct within a broad model of general personality. In contrast, the broad PPI factor identified in the current study (fearless impulsive antisociality) is consistent with the work of Neumann, Hare, and Newman (2007) on the superordinate nature of the PCL–R (Hare, 2003). In this sense, fearlessness, impulsive nonconformity, blame externalization, and machiavellian egocentricity may be indicators for a superordinate psychopathy factor. This interpretation is in line with behavior genetic research by Larsson et al. (2007), in which a single genetic factor accounted for the covariance of four psychopathy factors (interpersonal, affective, impulsive lifestyle, and antisocial tendencies; see also Blonigen et al., 2003).

It is remarkable that no published studies have examined the structural features of the PPI at the item level since its initial development. The complex pattern of current findings may be due, in part, to associations among the 160 items used to make up the eight PPI subscales. Certainly, the relatively low mean interitem subscale correlations suggest heterogeneity. Thus, the item-to-subscale relations for the PPI should be worked out. Also of interest would be research that compares the PPI to the PCL–R across diverse samples (Malterer, Lilienfeld, Neumann, & New-

man, 2007; Poythress et al., 1998). The PPI was designed to capture psychopathic characteristics suggested by diverse literatures; therefore, it assesses a range of psychopathic trait dimensions. Whether these dimensions can be narrowed to two, three, or more higher order factors remains to be seen.

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Appendix

Two-Factor Exploratory Factor Analysis (N = 515)

	Two-factor solution	
Subscale	A	B
Impulsive Nonconformity	**.43**	**.41**
Blame Externalization	**.61**	−.17
Machiavellian Egocentricity	**.68**	.12
Carefree Nonplanfulness	**.30**	−.04
Stress Immunity	**−.32**	**.82**
Social Potency	.05	**.45**
Fearlessness	**.47**	**.55**
Coldheartedness	−.03	.28

Note. Loadings < .30 are in boldface type for ease of comparison. The results in this table are from *Development and Preliminary Validation of a Self-Report of Psychopathic Personality* by S. O. Lilienfeld, 1990. Copyright 1990 by S. O. Lilienfeld. Adapted with permission.