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A Taxometric Analysis of the Psychopathy Checklist: Screening Version (PCL:SV): Further Evidence of Dimensionality

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A taxometric analysis of the Psychopathy Checklist: Screening Version (PCL:SV; S. D. Hart, D. N. Cox, & R. D. Hare, 1995) was performed on a group of 2,250 male and female forensic/psychiatric patients and jail/prison inmates. The 4 PCL:SV facet scores (Interpersonal, Affective, Impulsive Lifestyle, Antisocial Behavior) served as indicators in this study, and the data were analyzed with 3 principal taxometric procedures—mean above minus below a cut, maximum eigenvalue, and latent mode factor analysis. The results show evidence of dimensional structure on the PCL:SV in the full sample as well as in all 8 subsamples (men, women, Whites, Blacks, hospital patients, jail/prison inmates, file review with an interview, file review without an interview). These findings corroborate recent taxometric research on the Psychopathy Checklist—Revised (R. D. Hare, 1991, 2003) in which results have been largely dimensional in nature. It is concluded that scores on the PCL:SV differ quantitatively as points on a dimension (high vs. low psychopathy) rather than partitioning into qualitatively distinct categories of behavior (psychopath vs. nonpsychopath).

Keywords: Psychopathy Checklist, taxometric analysis, dimensional, categorical

Debate continues to rage over whether behavioral disorders form dimensions or discrete categories. One syndrome that has received a fair amount of attention in discussions on dimensional versus categorical conceptualizations of behavior is a pattern known as psychopathic personality disorder. Modern definitions of psychopathic personality disorder can be traced back to Cleckley (1941/1971), who considered psychopathy a disorder of personality marked by selfishness, superficiality, guiltlessness, and weak impulse control. Adopting Cleckley's personality perspective on psychopathy, Hare (1996) advanced the notion that psychopathic personality disorder was qualitatively distinct from other forms of social deviance, although in a recent publication Hare (2003) adopted a more equivocal view on the question of Psychopathy Checklist—Revised (PCL–R; Hare, 1991, 2003) latent structure. Whereas some researchers conceive of psychopathy as a discrete category of conduct separate from simple law-breaking behavior, other researchers consider psychopathy the extreme end of a continuum that encompasses a range of antisocial and self-serving activities (Lilienfeld, 1998). In distinguishing between these two viewpoints it is important to understand that the categorical perspective considers psychopathy qualitatively distinct from other forms of antisocial and self-serving behavior and that the dimensional perspective views psychopathy as the high end of a quantitatively ordered continuum of antisocial and self-serving conduct. The categorical perspective seeks to identify a taxon, defined as "an entity, type, syndrome, species, disease, or more generally, a nonarbitrary class" by Meehl and Golden (1982, p. 127), whereas the dimensional perspective seeks to uncover the psychopathic dimensions of behavior.

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The unofficial "gold standard" for psychopathy assessment is a rating scale known as the PCL–R (Hare, 1991, 2003). However, because the 20-item PCL–R requires several hours and a criminal record to complete, Hart, Cox, and Hare (1995) developed the 12-item Psychopathy Checklist: Screening Version (PCL:SV), with briefer item descriptions so that a formal criminal record was no longer required to complete the instrument. Research indicates that the PCL:SV correlates highly with the PCL–R ($r \geq .80$) despite being administered and scored in half the time it takes to administer and score the PCL–R (Hart et al., 1995). By collapsing, abbreviating, and simplifying PCL–R items, the PCL:SV soon became an effective screening instrument for psychopathy in correctional, forensic, and psychiatric settings. Several recent studies support the concurrent and predictive validity of the PCL:SV (Gray et al., 2004; Nicholls, Ogloff, & Douglas, 2004; Richards, Casey, Lucente, & Kafami, 2003), and an item response theory analysis determined that the PCL:SV conforms to the same two-, three-, and four-factor structure as the PCL–R (Cooke, Michie, Hart, & Hare, 1999). Although it remains a matter of controversy whether the PCL–R/PCL:SV is best represented by a three- or four-factor solution, two separate confirmatory factor analyses have shown that the four-factor model may provide the best overall fit for the PCL:SV (Hill, Neumann, & Rogers, 2004; Vitacco, Neumann, & Jackson, 2005). Consequently, the four-factor or facet model—Interpersonal, Affective, Impulsive Lifestyle, Antisocial Behavior—is employed in the present investigation, as it has been in recent taxometric research on the PCL–R.

Different approaches have been used to assess the latent structure of psychopathy. Blackburn and Coid (1998), for instance, used factor analysis to uncover evidence of dimensional structure on the PCL–R, whereas Hicks, Markon, Patrick, Krueger, and Newman (2004) used model-based cluster analysis to identify categories of psychopathy on the PCL–R. Although factor analysis and cluster analysis can be used to assess the latent structure of observed indicators, the assumptions upon which each procedure is based make them less than ideal for the purpose of distinguishing between dimensional and taxonic structure. As a result of the dimensional and categorical assumptions made by factor analysis and cluster analysis, respectively, factor analysis can produce dimensional results on measures that are distinctly categorical, and cluster analysis can produce categorical results on measures with an underlying dimensional structure. Latent class analysis is another procedure that has been used to compare continuous and discrete latent variable models (Markon & Krueger, 2006), and although this procedure can be useful in assigning cases to classes once a taxonic latent structure has been established with other procedures, it has a tendency to overidentify the number of latent classes and assumes that all indicators are statistically independent, a criterion that is often difficult to achieve in social science research (Ruscio, Haslam, & Ruscio, 2006). The taxometric method, on the other hand, was designed specifically for investigating the latent structure of constructs like psychopathy.

In the first study to investigate the latent structure of psychopathy with the taxometric method, Harris, Rice, and Quinsey (1994) observed a bimodal effect in a series of distributional analyses and taxon-consistent results in the MAXCOV-HITMAX approach for the eight items that displayed the best part-whole correlations with the total PCL–R score and in all nine Factor 2 items. They interpreted these results as proof that psychopathy, as measured by the PCL–R total and Factor 2 scores, is taxonic. Factor 1, on the other hand, failed to conform to a taxon. Subsequent research published by members of this same research team revealed that ratings based on *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994) conduct disorder criteria, the Psychopathy Checklist—Youth Version (Forth, Kosson, & Hare, 2003), and the Childhood and Adolescent Taxon Scale (Harris et al., 1994) all possessed a taxonic latent structure (Skilling, Quinsey, & Craig, 2001), as did ratings derived from *DSM–IV* diagnostic criteria for antisocial personality disorder (Skilling, Harris, Rice, & Quinsey, 2002).

Edens, Marcus, Lilienfeld, and Poythress (2006) have noted that Harris et al. (1994) (a) employed an atypical sample of offenders, a sizeable portion of whom had been found not guilty by reason of insanity (NGRI), (b) relied on highly skewed predictors that may have been constrained by low indicator validity, (c) scored each item on a 2-point scale (present, absent) rather than the 3-point scale traditionally used to score the PCL–R, and (d) based their evaluation on file information rather than including an interview. Speculating that any or all of these factors may have created a pseudotaxon that Harris et al. mistook for a true taxon, Edens et al. conducted their own taxometric analysis of the eight PCL–R items from Harris et al.'s study and the four PCL–R facet scores proposed by Hare (2003): Interpersonal (four items), Affective (four items), Impulsive Lifestyle (five items), and Antisocial Behavior (five items). Using more recently developed taxometric procedures and supplementing the file review with a personal interview, Edens et al. discerned that the dimensional model furnished a significantly better fit for PCL–R data collected on a group of 876 prison inmates and court-ordered substance-abuse patients than did the taxonic model. These findings supported an earlier study in which the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996), a self-report measure of psychopathic personality disorder, was used to investigate the latent structure of psychopathy in a group of 309 jail and prison inmates (Marcus, John, & Edens, 2004) and two recent investigations in which 409 (Walters, Duncan, & Mitchell-Perez, in press) and 4,865 (Guay, Ruscio, Knight, & Hare, in press) PCL–Rs were analyzed.

The significance of the PCL:SV, the focus of the present investigation, for taxometric research rests less on the instrument itself than on how and to whom the instrument is administered. Compared with the PCL–R, the PCL:SV is more applicable to nonincarcerated populations and more amenable to scoring without an interview. As such, the PCL:SV may yield results that differ from those obtained with the PCL–R (Edens et al., 2006; Guay et al., in press; Walters et al., in press). Three subgroups not included in any of the previously mentioned PCL–R taxometric studies are examined in this study: women, psychiatric patients, and protocols without an interview. Research indicates that compared with men, women display lower base rates of PCL–R/PCL:SV-defined psychopathy and differ somewhat on the behavioral correlates of psychopathy (Verona & Vitale, 2006). Civil and forensic psychiatric patients also have demonstrated a lower base rate of PCL:SV-defined psychopathy than correctional samples (Hart et al., 1995), and there is some evidence that the PCL:SV may be less predictive of violence in civil and forensic psychiatric patients than it is in prison inmates (Heilbrun et al., 1998; Nicholls et al., 2004). Although it is uncertain whether the base rate of PCL:SV-defined psychopathy differs as a function of whether an interview is

Table 1
Demographic and PCL:SV Characteristics of the Six Samples

Sample (reference)	*N*	Age		Gender (%)		Ethnic status (%)			PCL:SV	
		M	*SD*	Men	Women	White	Black	Other	*M*	*SD*
1. Skeem and Mulvey (2001)	864	29.86	6.18	57.4	42.6	69.2	28.6	2.2	8.49	5.56
2. Walters and Mandell (2007)	204	35.10	8.69	100.0	0.0	23.0	55.9	21.1	13.29	4.14
3. Gray et al. (2004)	799	32.00	9.25	83.4	16.6	71.3	20.4	8.3	7.39	5.03
4. Rogers et al. (2000)	103	30.47	7.47	0.0	100.0	56.3	32.0	11.7	12.75	5.87
5. Rogers et al. (2000)	149	35.33	9.36	100.0	0.0	40.3	45.0	14.8	14.32	5.00
6. Richards et al. (2003)	131	32.27	6.51	0.0	100.0	38.2	61.1	0.8	9.48	4.46

Note. There were significant differences between the six samples on age, $F(5, 2244) = 23.98$, $p < .001$; gender, $\chi^2(5) = 785.52$, $p < .001$; ethnic status, $\chi^2(10) = 318.18$, $p < .001$; and total Psychopathy Checklist: Screening Version (PCL:SV) score, $F(5, 2244) = 87.00$, $p < .001$.

included in the evaluation, Harris et al. (1994) scored their protocols from file information only in a study that found evidence of a taxon. Comparing PCL:SV protocols with and without an interview may help determine whether the taxonic results reported by Harris et al. were a consequence of how the PCL–R was scored. This study predicts that like the PCL–R, the PCL:SV will show consistent support for dimensional latent structure across a range of reasonably independent and nonredundant taxometric procedures and that the dimensionality of PCL:SV-defined psychopathy will not vary across gender (men, women), race (White, Black), setting (psychiatric, correctional), or mode of administration (file review with interview, file review without an interview).

Method

Participants

Participants were 2,250 male and female forensic/psychiatric patients and jail/prison inmates derived from six different samples. Sample 1 contained 864 male and female civil admissions to one of three psychiatric hospitals who were interviewed and rated on the PCL:SV as part of the MacArthur Violence Risk Assessment Study (Monahan et al., 2001). Sample 2 consisted of 204 male prison inmates from a medium security federal correctional institution located in the northeastern United States who were rated (without an interview) on the PCL:SV (Walters & Mandell, 2007). Sample 3 was comprised of 799 male and female patients released from four medium security forensic hospitals in the United Kingdom who were rated (without an interview) on the PCL:SV (Gray et al., 2004).[1] Sample 4 consisted of 103 female offenders housed in a county jail in the southwestern United States who were interviewed and rated on the PCL:SV (Rogers et al., 2000). Sample 5 contained 149 male psychiatric patients from a maximum security forensic state hospital located in the southwestern United States who were interviewed and rated on the PCL:SV (Rogers et al., 2000). Sample 6 encompassed 131 incarcerated female substance abusers from a state prison in the mid-Atlantic region of the United States who were rated (some with and some without an interview) on the PCL:SV (Richards et al., 2003). Basic demographic (age, gender, ethnic status) data and total PCL:SV scores for participants in each of the samples are listed in Table 1.

Measure

The PCL:SV is a 12-item abbreviated version of the 20-item PCL–R. Each item on the PCL:SV, like each item on the PCL–R, is rated on a 3-point scale: 0 = *item does not apply*, 1 = *item applies to a certain extent*, 2 = *item applies*. Most of the PCL:SV items are shortened and simplified versions of their corresponding PCL–R items. Item 5 (lacks empathy) of the PCL:SV, on the other hand, was derived by combining two different PCL–R items, Items 7 (shallow affect) and 8 (callous/lacks empathy). In addition, the PCL:SV items that measure antisocial behavior were modified slightly so that they could be scored in persons who did not possess a formal criminal record. Scores on the PCL:SV range from 0 to 24, with 13 being the recommended cutoff for possible psychopathy (Hart et al., 1995). The 12 PCL:SV items are grouped into two parts: Part 1 (callous, selfish, remorseless use of others) and Part 2 (chronically unstable and antisocial lifestyle). Part 1 is further subdivided into two facets, Interpersonal (superficial, grandiose, deceitful) and Affective (lacks remorse, lacks empathy, does not accept responsibility), as is Part 2, Impulsive Lifestyle (impulsive, lacks goals, irresponsible) and Antisocial Behavior (poor behavioral controls, adolescent antisocial behavior, adult antisocial behavior).

Interrater reliability data were collected on all six samples. In the MacArthur Violence Risk Assessment sample, reliability was assessed by having the nine interviewers who conducted the PCL:SV evaluations videotape their interviews with 5 cases and have the entire sample score all 45 videotaped interviews. Classifying scores falling within 5 points of each other as being in agreement resulted in a kappa coefficient of .66 (Skeem & Mulvey, 2001). In Walters and Mandell's (2007) sample, interrater reliability was assessed by having a second trained psychologist independently rate 25 randomly selected protocols. The intraclass correlation (ICC) for the total PCL:SV score in these 25 cases was .76. Interrater reliability in Gray et al.'s (2004) sample for the total PCL:SV score was uniformly high (ICC = .88–.91). In the two Rogers et al. (2000) samples, a senior forensic psychologist assured the reliability of the administration and scoring of the PCL:SV by reviewing the videotaped interviews conducted by the master's level clinician who administered and scored the PCL:SV protocols in these two studies. Finally, interrater reliability for the

[1] Participants from Gray et al.'s (2004) study were a subset of the 799 participants included in the present investigation.

trained raters in Richards et al.'s (2003) sample was found to be high (ICC = .90).[2]

Internal consistency estimates for the PCL:SV facet scores were calculated on the 1,655 protocols with no missing data. The sample was restricted to protocols with no missing items to avoid an inflated estimate of internal consistency resulting from the prorating procedure employed in this study. Because the prorating procedure required that the two rated items in a facet with a missing item be averaged and then essentially divided by two to form the prorated score, this could have created higher internal consistency results than were justified by the item intercorrelations. Internal consistency estimates, Cronbach alpha coefficients (α), and mean inter-item correlations (*r*), for the 1,655 protocols with no missing items were as follows: Interpersonal (α = .73, mean inter-item *r* = .48), Affective (α = .81, mean inter-item *r* = .59), Impulsive Lifestyle (α = .65, mean inter-item *r* = .38), and Antisocial Behavior (α = .65, mean inter-item *r* = .38).

Procedure

Informed consent and/or institution review board approval was obtained for the six samples used in this study. PCL:SV items that could not be completed were prorated for the purpose of combining them into the four PCL:SV facet scores: Interpersonal (Items 1, 2, and 3), Affective (Items 4, 5, and 6), Impulsive Lifestyle (Items 7, 9, and 10), and Antisocial Behavior (Items 8, 11, and 12). In the full sample of 2,250 PCL:SV protocols, there were only 736 (2.7%) missing items[3] and no more than one missing item per facet and no more than two missing items per PCL:SV record. Missing items on the PCL:SV facet scores were assigned a value of 0 if the sum of the two rated items was 0, a value of 2 if the sum of the two rated items was 4, and a value of 1 if the sum of the two rated items was 1–3. We prorated the total PCL:SV score for protocols with one or two missing items using the formula published in the manual (Hart et al., 1995). The four PCL:SV facet scores served as indicators in the current taxometric investigation. Analyses were conducted with the full sample (*N* = 2,250) as well as with the following subsamples: men (*n* = 1,515), women (*n* = 735), Whites (*n* = 1,383), Blacks (*n* = 704), hospital patients (*n* = 1,812), jail/prison inmates (*n* = 438), file review with an interview (*n* = 1,116), and file review without an interview (*n* = 1,003).

Statistical Analyses

We performed taxometric analyses for this study using Ruscio's (2006) taxometric software program for R language. The taxometric procedures themselves were originally designed by Meehl and colleagues (Meehl & Yonce, 1994, 1996; Waller & Meehl, 1998) to evaluate the latent structure of psychopathological constructs, such as schizotaxia. There were three principal procedures employed in this study: mean above minus below a cut (MAMBAC; Meehl & Yonce, 1994), maximum eigenvalue (MAXEIG; Waller & Meehl, 1998), and latent mode factor analysis (L-Mode; Waller & Meehl, 1998). MAMBAC assumes that if a taxon exists then there will be an optimal cutting score that separates the taxon and complement groups. The MAMBAC procedure creates a series of cuts along a PCL:SV indicator and compares the differences in scores on a second PCL:SV indicator for cases falling above and below each cut. Using the default option in Ruscio's (2006) program, we made 50 cuts across each PCL:SV indicator, and we assigned cases to groups using the base rate classification procedure. In the standard MAMBAC procedure, all possible two variable input–output pairs are analyzed. In the summed input version of MAMBAC, a single variable is employed as the output indicator, and the input indicator is a composite of the three remaining indicators. Summed input MAMBAC was employed in this study because it was the procedure utilized in the following previous studies on the PCL–R: Edens et al. (2006), Guay et al. (in press), and Walters et al. (in press). Taxonic constructs are identified by a peaked curve, whereas dimensional constructs form a concave or dish-shaped curve that bows upward at the ends (Meehl & Yonce, 1994).

MAXEIG is a multivariate extension of Meehl and Yonce's (1996) maximum covariance (MAXCOV) taxometric procedure. MAXCOV and MAXEIG create subsamples that can be used to assess the association between input and output indicators. If this association is dependent on the proportion of taxon and complement members in each subsample, then the MAXCOV/MAXEIG curve will peak in the subsample that contains an equal number of taxon and complement members. A peak suggests the presence of a taxon, with the location of the peak representing the base rate. Higher base rate taxons peak to the left of center on the MAXCOV/MAXEIG curve, whereas lower base rate taxons peak to the right of center on the MAXCOV/MAXEIG curve (Meehl & Yonce, 1996). Conversely, dimensional constructs produce generally flat, nonpeaked curves because of the relative constancy of association between indicators across subsamples. The principal difference between MAXCOV and MAXEIG is that whereas MAXCOV examines the covariance between two output indicators, MAXEIG utilizes the first eigenvalue of the covariance matrix constructed from two or more output indicators (Waller & Meehl, 1998). The summed input MAXEIG procedure (a pair of variables serve as output, and the remaining variables are com-

[2] The nine raters for Sample 1 (Skeem & Mulvey, 2001) received a full day of training from Robert Hare and Stephen Hart and sent their PCL:SV protocol ratings of 10 videotaped cases to Steven Hart for approval and reliability analysis. The single rater for Sample 2 (Walters & Mandell, 2007) participated in a 3-day training seminar on the PCL–R/PCL:SV conducted by a licensed clinical psychologist who was certified to administer, score, and interpret the PCL–R. The four raters for Sample 3 (Gray et al., 2004) received initial training from Nicola S. Gray, a certified trainer with Darkstone, and then received 3 days of training from Robert Hare and Adelle Forth. The two raters for Samples 4 and 5 (Rogers et al., 2000) were each master's-level psychologists who received extensive training with Richard Rogers, a researcher on psychopathy; the rater for Sample 4 also attended a 1-day workshop on the PCL–R/PCL:SV with Robert Hare. Staff who served as raters for Sample 6 (Richards et al., 2003) received a full day of training from Robert Hare and participated in monthly training sessions conducted by a psychologist with training in the PCL–R/PCL:SV.

[3] There were large differences between the samples in the number of missing items. Sample 1 (Skeem & Mulvey, 2001) had 26 missing items in 864 PCL:SV protocols (0.2%). Sample 2 (Walters & Mandell, 2007) had 208 missing items in 204 PCL:SV protocols (8.5%). Sample 3 (Gray et al., 2004) had 501 missing items in 799 PCL:SV protocols (5.2%). Sample 4 (Rogers et al., 2000) had 0 missing items in 103 PCL:SV protocols (0.0%). Sample 5 (Rogers et al., 2000) had 0 missing items in 150 PCL:SV protocols (0.0%). Sample 6 (Richards et al., 2003) had 1 missing item in 131 PCL:SV protocols (0.1%).

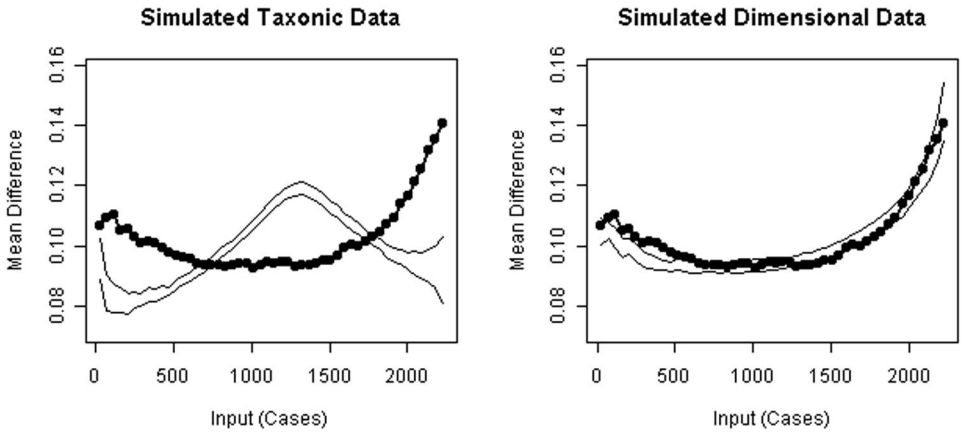

Figure 1. Average mean above minus below a cut (MAMBAC)-summed input curve for the four Psychopathy Checklist: Screening Version facet scores (darker line) in comparison with simulated taxonic and dimensional data (lighter lines represent one standard deviation above and below the mean).

bined to form the input indicator) was employed in this study as it was in Guay et al.'s (in press) study. In the present study, we calculated MAXEIG with 50 windows showing 90% overlap, and we assigned cases to groups using the base rate classification procedure.

The third taxometric procedure employed in this study was L-Mode. The L-Mode procedure calculates the first (and largest) principal factor of the four PCL:SV facet score indicators and then plots the distribution of participants' scores on this single latent factor. If the indicators vary as a function of latent taxa, then the factor scores will generally split into two groups, a taxon and complement, giving the graph a bimodal appearance. A unimodal distribution, on the other hand, suggests the presence of a dimensional construct. Even so, a taxon is sometimes hidden by a unimodal distribution, and a dimensional construct is sometimes embedded in a bimodal distribution (Waller & Meehl, 1998). L-Mode also produces base rate estimates, one of which is calculated by averaging the two estimated latent modes, one to the left and one to the right of $x = 0$, and one of which is calculated from the proportion of cases classified into the putative taxon. These base rate estimates are sometimes compared with one another and with the base rate estimates produced by the MAMBAC and MAXEIG procedures in the belief that greater consistency between base rate estimates within and across procedures is a sign of taxonicity. However, a recent Monte Carlo study by Ruscio (in press) challenges the meaningfulness of base rate consistency as a sign of taxonicity, and so base rate consistency is not employed as a measure of taxonicity in this study.

Model fit is the principal criterion used to evaluate latent structure in this study. Two principal measures of model fit are employed in this study: (a) visual inspection of the MAMBAC, MAXEIG, and L-Mode curves relative to simulated comparison (taxonic and dimensional) curves generated from 20 data sets, and (b) the comparison curve fit index (CCFI). Research supports the utility of the CCFI in assessing taxometric structure (Ruscio, in press; Ruscio & Marcus, 2007; Ruscio, Ruscio, & Meron, 2007). Comparison curves between the actual data and simulated taxonic

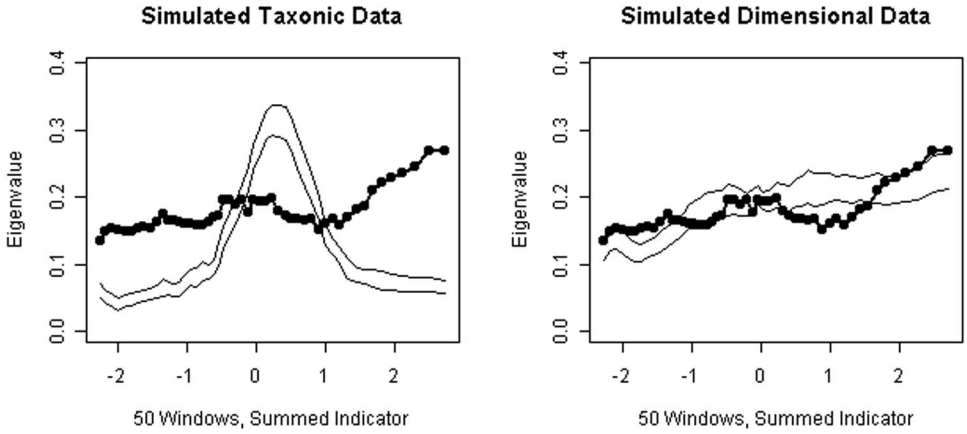

Figure 2. Average maximum eigenvalue (MAXEIG)-summed input curve for the four Psychopathy Checklist: Screening Version facet scores (darker line) in comparison with simulated taxonic and dimensional data (lighter lines represent one standard deviation above and below the mean).

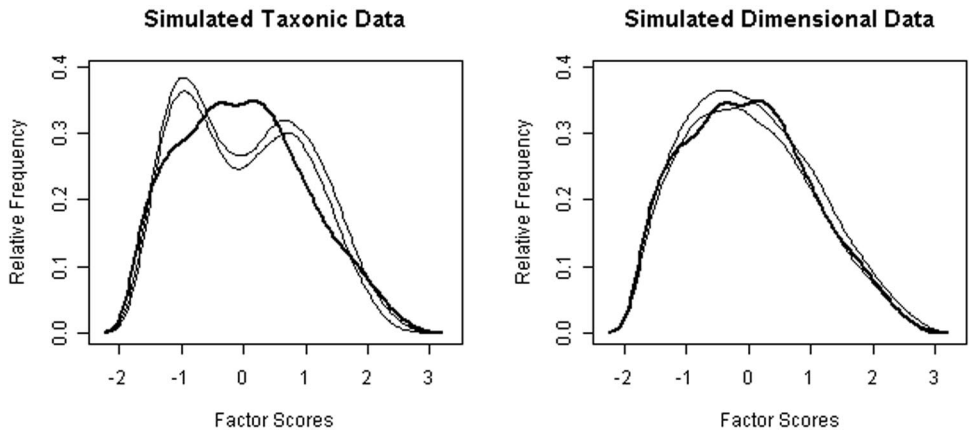

Figure 3. Latent mode factor analysis (L-Mode) curve for the four Psychopathy Checklist: Screening Version facet scores (darker line) in comparison with simulated taxonic and dimensional data (lighter lines represent one standard deviation above and below the mean).

and dimensional data (see Figures 1, 2, and 3) were presented to 10 nonpsychologists unfamiliar with taxometric procedures who then selected the option (taxonic or dimensional) they believed best fit the data. These simulated curves were created with a bootstrapping technique (B = 20 for each structure) that controls for the unique distributional and correlational characteristics of the research data (Ruscio, 2006). The CCFI is calculated from the root-mean-square residual (RMSR) estimates obtained for the research data relative to the simulated taxonic and dimensional data: $CCFI = Fit_{RMSR\text{-}dim}/(Fit_{RMSR\text{-}dim} + Fit_{RMSR\text{-}taxon})$. A value of .5 on the CCFI suggests equally good (or poor) fit between the actual data and the simulated taxonic and dimensional data. CCFI values below .5 (toward a minimum value of 0) show evidence of dimensional structure, whereas CCFI values above .5 (toward a maximum value of 1.0) show evidence of taxonic structure. Ten replications were used to calculate the MAMBAC and MAXEIG curves because indicators with small ranges (0–6 in the present study) can sometimes yield misleading results, and averaging replications can help stabilize a curve.

Results

Table 2 lists the means, standard deviations, skew, and validity estimates of the four PCL:SV indicators used in this study. Three out of the four indicators were positively skewed beyond two standard errors of skew. The one negatively skewed indicator (Impulsive Lifestyle) was skewed less than two standard errors of skew. Nuisance covariance was found to be within acceptable limits, as represented by a mean full sample correlation of .45, mean taxon correlation of .00, and mean complement correlation of .18. The average indicator validity for the full sample was 1.71 (σ) using a cutting score of 13 on the total PCL:SV, which exceeds the minimally acceptable value of 1.25 (σ) recommended by Meehl (1995). Mean between-groups validity estimates in the full sample for the MAMBAC, MAXEIG, and L-Mode analyses were 1.66, 1.67, and 1.64, respectively.

Table 2
Descriptive Statistics and Validity Indicators for the Four PCL:SV Facet Scores

Validity indicator	*M*	*SD*	Skew[a]	*SD*[b]
1. Interpersonal	1.36	1.63	1.14	1.83
2. Affective	2.46	2.02	0.30	1.72
3. Impulsive Lifestyle	2.97	1.81	−0.01	1.55
4. Antisocial Behavior	2.40	1.81	0.36	1.73

Note. PCL:SV = Psychopathy Checklist: Screening Version.
[a] The standard error of measurement for skew in this sample was .05.
[b] Estimated with a cutting score of 13 on the total PCL:SV.

MAMBAC

The summed input MAMBAC procedure employs each variable as an output indicator and organizes the three remaining variables into a composite input indicator. This procedure yielded four curves for the four indicators with a mean base rate of .43 and standard deviation of .09. The summed input MAMBAC for the total sample of 2,250 PCL:SV protocols was viewed by 10 out of 10 evaluators as fitting the simulated dimensional model better than the simulated taxonic model (see Figure 1). The dimensional nature of the averaged MAMBAC curve was further substantiated by a CCFI of .140 and the absence of a taxonic peak on any of the individual curves.

MAXEIG

In the summed input MAXEIG, two variables are removed and made output indicators, whereas the two remaining variables are organized into a composite input indicator. Base rates averaged across six MAXEIG curves produced an estimated taxon base rate of .41 with a standard deviation of .30. The CCFI for the summed input MAXEIG was .211. All 10 raters judged the simulated dimensional model as providing a better fit for the averaged MAXEIG curve than the simulated taxonic model (see Figure 2). Just as with the individual MAMBAC

Table 3
Overview of Taxometric Results for Total Sample and Eight Subsamples

			MAMBAC		MAXEIG		L-Mode
Sample type	*N*	BR	CCFI	Raters	CCFI	Raters	Raters
Total sample	2,250	27.9	.140	10	.211	10	10
Male subsample	1,515	31.3	.240	10	.268	10	10
Female subsample	735	20.8	.269	10	.406	9	10
White subsample	1,383[a]	22.1	.213	10	.293	10	10
Black subsample	704[a]	37.8	.222	10	.302	9	10
Psychiatric subsample	1,812	23.3	.158	10	.235	10	10
Correctional subsample	438	46.6	.197	10	.260	10	10
With an interview	1,116[b]	30.5	.127	10	.211	10	10
Without an interview	1,003[b]	25.1	.373	9	.339	10	10

Note. MAMBAC = summed input mean above minus below a cut taxometric procedure; MAXEIG = summed input maximum eigenvalue taxometric procedure; L-Mode = latent mode factor analysis taxometric procedure; BR = base rate of psychopathy using a cutting score of 13 on the Psychopathy Checklist: Screening Version; CCFI = comparison curve fit index; Raters = number of raters (out of 10) identifying the actual data curve as being more congruent with the simulated dimensional model than with the simulated taxonic model (B = 20 for each structure).
[a] There were 163 participants with other ethnic status, mostly Hispanic.
[b] It is unknown which participants in Richards et al.'s (2003) study were interviewed and which participants in Richards et al.'s study were not interviewed, and so these data are not included in either the "with an interview" or "without an interview" subsamples.

curves, there was no evidence of a taxonic peak on any of the individual MAXEIG curves.

L-Mode

L-Mode parameter estimates of the taxon base rate were .12 and .98 (M = .55), whereas the estimated base rate from a classification of cases was .52. Because Ruscio's taxometric program does not calculate RMSR and CCFI values for the L-Mode procedure, visual inspection of the data curve in relationship to the simulated dimensional and taxon curves was the only measure of fit available to test the L-Mode results (see Figure 3). Ten out of 10 raters identified the L-Mode graph as being more congruent with dimensional structure than with taxonic structure. In other words, a unimodal interpretation of the L-Mode graph was favored over a bimodal interpretation.

Supplemental Analyses

Table 3 summarizes the MAMBAC, MAXEIG, and L-Mode results for the total sample as well as for the male, female, White, Black, psychiatric, correctional, file review with an interview, and file review without an interview subsamples. Fifty out of 50 tests (MAMBAC CCFI, MAMBAC subjective ratings, MAXEIG CCFI, MAXEIG subjective ratings, L-Mode subjective ratings for the total sample, eight subsamples, and total sample with no missing values)[4] favored a dimensional interpretation of the latent structure of the PCL:SV.

Discussion

Instead of applying tests of statistical significance to taxometric results, investigators search for patterns of consistency across nonredundant procedures in an effort to determine whether the underlying construct being assessed is taxonic or dimensional in nature (Ruscio et al., 2006). The present investigation shows consistent support for dimensional latent structure in PCL:SV-defined psychopathy across three quasi-independent procedures (MAMBAC, MAXEIG, L-Mode) and in 50 out of 50 tests spread across divergent procedures, methodologies (CCFI, subjective evaluations), and samples (total sample, no missing items sample, and eight subsamples). In line with research previously conducted on the PCL–R (Edens et al., 2006; Guay et al., in press; Walters et al., in press), it would appear that people differ quantitatively rather than qualitatively on the psychopathy construct as measured by the PCL:SV and PCL–R. A unique aspect of the present investigation was its exploration of the latent structure of psychopathy in women and psychiatric patients. Despite a lower base rate of psychopathy in both groups and modest to moderate gender and setting (psychiatric versus correctional) variations in some of the correlates of psychopathy (Nicholls et al., 2004; Verona & Vitale, 2006), the results show consistent support for a dimensional interpretation of the latent structure of psychopathy. The present study is also unique in demonstrating that the latent structure of psychopathy is dimensional whether an interview is included with the file review when scoring the PCL:SV. This finding suggests that the taxonic results reported by Harris et al. (1994) were not simply an artifact of them not including an interview in the PCL–R evaluation. In subsamples formed on the basis of gender, race, setting, and format (with or without an interview), and with base rates of possible psychopathy (PCL:SV total score $\geq$ 13) ranging from 20.8% to 46.6% (compared with a

[4] When only protocols with no missing items (n = 1,655) were subjected to taxometric analysis, the following results surfaced: MAMBAC CCFI = .156, 10 out of 10 raters favoring the dimensional solution; MAXEIG CCFI = .280, 10 out of 10 raters favoring the dimensional solution; L-Mode, 10 out of 10 raters favoring the dimensional solution.

general population base rate of 2%; Hart et al., 1995),[5] this study uncovered consistent support for dimensional latent structure in PCL:SV-defined psychopathy.

There are both theoretical and practical implications to the present findings. From a theoretical standpoint, the presence of dimensional latent structure in PCL–R/PCL:SV-defined psychopathy suggests that the psychopathy construct may correspond with traditional personality trait theory in light of the latter's strong dimensionality assumptions. The dimensions of psychopathy might consequently be considered variants of normal personality as described by such popular theories as the Five Factor Model of personality (FFM; McCrae & Costa, 1990). The FFM maintains that personality is structured by five broad trait dimensions: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Skeem, Miller, Mulvey, Tiemann, and Monahan (2005) analyzed the relationship between the two- and three-factor models of the PCL:SV and the five FFM traits dimensions as measured by the Neuroticism–Extroversion–Openness (NEO) Five-Factor Inventory (Costa & McCrae, 1989). The results revealed that antagonism or low agreeableness was the strongest correlate of all factors in both PCL:SV models, lending support to the view that low agreeableness may be responsible for the overlap between PCL–R/PCL:SV factors (Lynam et al., 2005). In the three-factor model, Factor 1 (Interpersonal Features) correlated positively with extraversion and negatively with agreeableness; Factor 2 (Affective Features) correlated negatively with openness and agreeableness; and Factor 3 (Behavioral Features) correlated positively with neuroticism and negatively with agreeableness, openness, and conscientiousness (Skeem et al., 2005). The theoretical implication of the present results, then, is that it may be possible to place PCL–R/PCL:SV-defined psychopathy within a broader conceptual framework (FFM) yet use it to define various aspects and parameters of the model, particularly the low agreeableness that defines all of the PCL–R/PCL:SV dimensions and the unique relationships that form between some of the FFM traits and PCL–R/PCL:SV dimensions (i.e., high-extraversion Interpersonal Features; low-openness Affective Features; high-neuroticism/low-openness/low-conscientiousness Behavioral Features).

The present results also hold important implications for clinical practice in the form of cut scores. PCL–R/PCL:SV cut scores have been a source of debate and contention ever since Hare (1991) suggested that a score of 30 or higher on the PCL–R might be useful in classifying individuals as psychopaths. On a measure like the PCL–R, which assesses a dimensional construct, there is no meaningful demarcation between a score of 29 and a score of 30. Whereas most psychologists appreciate this fact, many judges, probation officers, and parole boards do not. It may therefore be helpful when reporting the results of a PCL–R/PCL:SV evaluation to a judge, probation officer, or parole board that the clinician use ranges or percentiles rather than specific cut scores. The presence of dimensionality, however, does not preclude the use of cut scores. We would argue that cut scores can be helpful in both research and clinical contexts as long as the user recognizes that the cut score does not represent a taxonic boundary or that the group identified as psychopathic does not represent a natural category. The ability to raise or lower a cut score on the basis of the relative cost of false positive and false negative determinations is a particularly attractive feature of cut scores. In situations in which a diagnosis of psychopathy can have severe consequences for the individual being evaluated—such as a parole hearing, civil commitment proceeding, or death penalty deliberation—the cut score can be raised to minimize false positive predictions. Conversely, if the goal is to identify as many individuals with significant psychopathic tendencies as possible, such as when using the PCL–R/PCL:SV to screen for therapy candidates or research participants, then the cut score could be lowered to maximize the true positive rate and minimize the false negative rate. In other contexts, researchers or clinicians may not want to limit themselves to a single cut score but look instead at multiple cut scores or even the entire range of scores. The fact that the psychopathy construct, as measured by the PCL–R or PCL:SV, is dimensional in nature allows for greater flexibility in application of the PCL–R/PCL:SV to various research and clinical contexts than if the underlying construct was taxonic.

There are at least two potential limitations to the present investigation. The first potential limitation is rater bias. Beauchaine and Waters (2003) have reported that it is possible to influence observer ratings by manipulating observer expectations. Hence, a rater who believes that psychopathy is dimensional is likely to construct ratings consistent with a dimensional model of psychopathy. Given the variety of raters contributing PCL:SV data to this study and the moderate to good interrater reliability achieved in each sample, rater bias may be less problematic than if only one or two raters had been used, although rater bias cannot be completely ruled out as an alternate explanation for the results of this study. A low probability of collective bias on the part of raters contributing PCL:SV data to this study is nonetheless suggested by wide variations in PCL:SV scores and missing items between the six samples contributing profiles to this study. Mono-operation bias (Shadish, Cook, & Campbell, 2002) is a second limitation of this study. All four indicators included in the present investigation were derived from the same source (i.e., PCL:SV). Therefore, spurious results could have been produced from idiosyncracies in the PCL:SV. It should be noted, however, that research conducted on self-report measures of psychopathy, such as the PPI and Levenson Self-Report Psychopathy Scale (Levenson, Kiehl, & Fitzpatrick, 1995), have also produced dimensional results (Marcus et al., 2004; Walters, Brinkley, Magaletta, & Diamond, 2006). Proper evaluation of the psychopathy taxometric hypothesis demands that rating scales, such as the PCL:SV and PCL–R, be combined with self-report inventories such as the PPI and physiological measures, including electrodermal conditioning to aversive stimuli (Lykken, 1957), in accordance with Meehl's (1995) assertion that taxometric analyses are most effective when based on indicators drawn from multiple methods. The use of multiple measures from different sources and domains is therefore a direction for future taxometric research on psychopathy.

[5] Owing to the fact that the samples used in this and all previous taxometric studies on the PCL–R/PCL:SV were selected from populations with above average rates of psychopathy, it is still possible that a taxon could be observed in a general population sample in which a wider range of participants is represented. Nonetheless, groups from the present study with relatively low base rates of psychopathy (i.e., women, Whites, psychiatric patients) displayed consistent evidence of dimensional latent structure.

In four separate studies conducted over the past several years on two different versions of the Psychopathy Checklist, the results have consistently shown that the concept of psychopathy is dimensional, at least when psychopathy is measured with the PCL–R/PCL:SV. These findings clash with the earlier research results of Harris et al. (1994) and Skilling et al. (2001, 2002). Several of the practices and procedures utilized in the earlier studies may account for the lack of congruence between the present findings and the results obtained by Harris et al. and Skilling et al. Using indicators of questionable validity (Harris et al., 1994), the Goodness of Fit Index to measure fit (Skilling et al., 2002), distributional analysis to identify taxonicity (Harris et al., 1994), and base rate comparison to assess latent structure (Skilling et al., 2001), these investigators uncovered evidence of a possible taxon for psychopathy. Their conclusions, however, were compromised by faulty procedures and flawed strategies (see Ruscio et al., 2006), which may explain why the earlier research suggested taxonic structure when more recent studies have shown consistent evidence of dimensional structure. The results of recent taxometric analyses on antisocial personality (Marcus, Lilienfeld, Edens, & Poythress, 2006) and criminal thinking and behavior (Walters, in press) also furnish support for the dimensional hypothesis. Future research could help determine whether psychopathy, antisocial personality, and criminality fall along the same dimension or dimensions—such as the externalization spectrum proposed by Krueger, Markon, Patrick, and Iacono (2005)—or whether there is a qualitative distinction between these three dimensionally structured concepts; for as Meehl (1995) has noted, taxons can exist within dimensions, and dimensions can exist within taxons.

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