

UC Davis

UC Davis Previously Published Works

Title

Development and Validation of Personality Disorder Spectra Scales for the MMPI-2-RF

Permalink

<https://escholarship.org/uc/item/51m2d6r3>

Journal

Journal of Personality Assessment, 100(4)

ISSN

0022-3891

Authors

Sellbom, Martin
Waugh, Mark H
Hopwood, Christopher J

Publication Date

2018-07-04

DOI

10.1080/00223891.2017.1407327

Peer reviewed





Development and Validation of Personality Disorder Spectra Scales for the MMPI-2-RF

Martin Sellbom, Mark H. Waugh & Christopher J. Hopwood

To cite this article: Martin Sellbom, Mark H. Waugh & Christopher J. Hopwood (2018): Development and Validation of Personality Disorder Spectra Scales for the MMPI-2-RF, Journal of Personality Assessment, DOI: [10.1080/00223891.2017.1407327](https://doi.org/10.1080/00223891.2017.1407327)

To link to this article: <https://doi.org/10.1080/00223891.2017.1407327>

 View supplementary material 

 Published online: 10 Jan 2018.

 Submit your article to this journal 

 View related articles 

 View Crossmark data 



Development and Validation of Personality Disorder Spectra Scales for the MMPI–2–RF

Martin Sellbom,¹ Mark H. Waugh,² and Christopher J. Hopwood³

¹Department of Psychology, University of Otago, Dunedin, New Zealand; ²Department of Psychology, University of Tennessee & Oak Ridge National Laboratory; ³Department of Psychology, University of California, Davis

ABSTRACT

The purpose of this study was to develop and validate a set of MMPI–2–RF (Ben-Porath & Tellegen, 2008/2011) personality disorder (PD) spectra scales. These scales could serve the purpose of assisting with DSM–5 PD diagnosis and help link categorical and dimensional conceptions of personality pathology within the MMPI–2–RF. We developed and provided initial validity results for scales corresponding to the 10 PD constructs listed in the DSM–5 using data from student, community, clinical, and correctional samples. Initial validation efforts indicated good support for criterion validity with an external PD measure as well as with dimensional personality traits included in the DSM–5 alternative model for PDs. Construct validity results using psychosocial history and therapists' ratings in a large clinical sample were generally supportive as well. Overall, these brief scales provide clinicians using MMPI–2–RF data with estimates of DSM–5 PD constructs that can support cross-model connections between categorical and dimensional assessment approaches.



ARTICLE HISTORY


Received 29 June 2017
Revised 17 September 2017

A variety of approaches are available to personality assessors for measuring personality disorder (PD). They reflect differing paradigmatic and methodological emphases. The received tradition dates from the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed. [DSM–III]; American Psychiatric Association, 1980), which introduced operationalized diagnostic criteria, polythetic criteria-count algorithms, and categorical PD diagnosis, and has been maintained in each subsequent revision of the DSM. An increasing emphasis in PD assessment, however, makes use of the trait-dimensional approach (e.g., Livesley's [1987] dimensional model and measure, the Personality Psychopathology Five [Harkness & McNulty, 1994], Simms et al.'s [2011] Computer Adaptive Test for Personality Disorder, and Five-Factor Model PD prototypes [Lyman & Widiger, 2001]). The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed. [DSM–5]; American Psychiatric Association, 2013) Section III approach offers an alternative model of personality disorder (AMPD) that allows for the diagnosis of PD types via assessments of personality dysfunction and trait dimensions. Overall, the field shows increasing interest in a more dimensional approach to PD diagnosis (e.g., Bernstein, Iscan, & Maser, 2007; Verheul, 2005), consistent with some of the aims of this study. Yet, it is important to note that the typological approach persists for reasons including familiarity, clinical tradition (Gunderson, 2010), concerns about the pace of nosological change (Applebaum, 2017), and its status as the official operational approach of the DSM. These concerns generally reflect the significance of clinical utility in diagnostic schemes (Mullins-Sweatt & Widiger, 2009), a heuristic that

spans practical concerns of ease of use, treatment planning, and communication. In addition to these applied concerns, from the point of view of philosophy of science, maintaining parallel tracks of epistemic iteration across different theoretical approaches is consistent with modern scientific pluralism (Chang, 2017) which recognizes the “dappled” nature of the universe (Cartwright, 1999). This position might seem counter-intuitive, but the existence and benefits of parallel models has a long history across fields of science (physics, chemistry, biology); Chang (2017) argued, despite the emerging dimensional paradigm change in PD nosology (Zacher & Kendler, 2017), a pluralistic conception of psychiatric taxonomy offers points of differential utility and, importantly, is unlikely to interfere with scientific progress.

The purpose of this investigation was to develop DSM-based PD spectra scales for the Minnesota Multiphasic Personality Inventory–2 Restructured Form (MMPI–2–RF; Ben-Porath & Tellegen, 2008/2011). The term *spectra* assumes PDs are essentially dimensional constructs reflecting constellations of pathological traits, symptoms, styles, and concerns. Thus, a PD spectra scale is regarded consistent with the way the MMPI (Hathaway & McKinley, 1943) family of instruments and other psychometric tools are typically interpreted, and with the more general notion that personality pathology constructs are dimensional in nature. Indeed, points of connection can be made with the quantitative classification paradigm that views psychopathology as hierarchically organized dimensional constructs. Robust cross-connections between categorical and dimensional PD characterization have been demonstrated

CONTACT Martin Sellbom  msellbom@psy.otago.ac.nz  Department of Psychology, PO Box 56, University of Otago, Dunedin 9054, New Zealand.

 Supplemental data for this article can be accessed on the [publisher's website](#).

(e.g., Lynam & Widiger, 2001; Samuel & Widiger, 2004, 2008), including with the AMPD (e.g., Morey & Skodol, 2013; Samuel, Hopwood, Krueger, Thomas, & Ruggero, 2013; Samuel, Lynam, Widiger, & Ball, 2012), the CAT-PD (Evans, & Simms, 2017), and within the MMPI-2-RF (Anderson et al., 2015; Finn, Arbisi, Erbes, Polusny, & Thuras, 2014; Sellbom & Smith, 2017). Furthermore, Millon and Strack (2015) also explicitly used the term PD *spectrum* to express a dimensional depiction of the array of multilevel personality constructs within a meaningful constellation of PD traits, temperaments, symptoms, and characteristics. A legacy conception that resembles this idea is *syndrome*. However, we differentiate spectrum from syndrome in terms of (a) dimensional (not categorical) structure, and (b) the point of view that PDs are less amenable to medical model assumptions and natural science-based etiologies, properties inherent in classical syndromes (Zachar & Kendler, 2007). Thus, we anticipate that our PD spectra scales would find a home in an environment where multiple assessment approaches coexist in a relatively complicated but common empirical and clinical space, consistent with the recommendations of Chang (2017) regarding psychiatric nosology and Wiggins (2003) with respect to different paradigms of personality assessment, and be useful for the assessment of PDs with the MMPI-2-RF.

Assessing personality pathology with the MMPI

The variety of approaches available to assess PD within the MMPI family of instruments mirrors the general situation in the field. Harkness and McNulty (1994) developed the Personality Psychopathology Five (PSY-5) model as a trait-dimensional alternative to the categorical syndrome approach. Subsequently, Harkness, McNulty, and Ben-Porath, 1995 developed scales for the PSY-5 from the MMPI-2 (Butcher et al., 2001) item pool, paralleling the psychometric trait tradition as seen in the Five-Factor Model (FFM) and Big Five (e.g., Digman, 1990; McCrae & Costa, 1987). The PSY-5 model was replicated in Markon, Krueger, and Watson's (2005) integration of adaptive and maladaptive personality traits. Thus, the PSY-5 aligns well with the modern paradigm of quantitative psychopathology (e.g., Kotov et al., 2011; Krueger, Tackett, & McDonald, 2016; Markon, 2010; Wright et al., 2013; see Harkness et al., 2012, for a review).

Prior to this work, however, Morey, Waugh, and Blashfield (1985) published the first set of MMPI PD scales. These scales were modeled after the *DSM-III* PD categories and imported into the revised MMPI-2 (Greene, 2000). Levitt and Gotts (1995) developed an alternate version of these PD scales reflecting the *DSM-III-R* (American Psychiatric Association, 1987) criteria. Somwaru and Ben-Porath (1995) later offered a revised version of PD scales based on the MMPI-2 item pool and conforming to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [DSM-IV] PDs; American Psychiatric Association, 1994).

Existing research on the Morey et al. (MWB; 1985), Levitt and Gotts (LG; 1995), and Somwaru and Ben-Porath (SBP; 1995) MMPI/MMPI-2 PD scales serves as the foundation of the current project. These different PD scales have seen varying levels of empirical support. Several investigations have

supported the relative validity and criterion performance of the MWB scales (Blais, Hilsenroth, Castlebury, Fowler, & Baity, 2001; Hicklin & Widiger, 2000; Jones, 2005; Schuler, Snibbe, & Buckwalter, 1994; Wise, 1996; but see Streiner, & Miller, 1988). The MWB PD scales typically have been viewed as the backdrop against which incremental validity of the LG and SBP scales are evaluated. Empirical studies (Hicklin & Widiger, 2000; Jones, 2005) generally show the PD scales demonstrate adequate convergent validity with each other across different versions of a given scale, and other relevant benchmarks or measures (e.g., Millon Clinical Multiaxial Inventory-II; Millon, 1987) show expected convergences.

However, the relative pattern of correlations at times varies, discriminant validity generally fares less well, and psychometric properties of PD scale versions show marked differences (Hicklin & Widiger, 2000; Jones, 2005). It is notable that item overlap between the different MMPI-PD scale sets is surprisingly low. For example, the Borderline scale for MWB and LG sets share 16 items (of 29 and 22 total scale items, respectively); the MWB and SBP sets share 12 items (of 29 and 57 scale items, respectively); and LG and SBP share 17 items (of 22 and 57 items, respectively). As such, there is room for an integrated and updated approach to MMPI assessment of PDs.

Furthermore, none of these scales can be scored with the MMPI-2-RF, which represents a contemporary and psychometrically up-to-date alternative to the MMPI-2, due to insufficient items. The MMPI-2-RF is a briefer instrument developed from a sophisticated internal consistency-based psychometric strategy, and it aligns well with other contemporary approaches to dimensional clinical assessment (Lee, Sellbom, & Hopwood, 2017). For example, the item pool could be decomposed into commonly recognized major dimensions of internalizing, externalizing, and thought disorder dimensions—consistent with current conceptions within quantitative psychopathology (e.g., Caspi et al., 2014; Kotov et al., 2011; Markon, 2010; Wright et al., 2013) and the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017). This property, along with the established cross-connections between categorical and dimensional PD constructs, indicates that the MMPI-2-RF might support the development of PD spectra based on traditional *DSM* diagnoses (see also Finn et al., 2014).

The potential for the MMPI-2-RF to yield PD spectra scales is also supported by several recent studies. Sellbom, Smid, De Saeger, Smit, and Kamphuis (2014) demonstrated that the MMPI-2-RF PSY-5 scales were significantly and meaningfully associated with PD criteria assessed through structured clinical interviews in Dutch clinical and forensic samples; many of these findings were replicated in Finn et al. (2014). Similarly, Anderson et al. (2015) added that the full set of MMPI-2-RF scales predicted *DSM-5* Section II PD criteria for 7 of the 10 PDs (with sufficient variability) in those same samples. In a large sample of university students, Sellbom and Smith (2017) further showed that the MMPI-2-RF exhibited generally strong associations with *DSM-5* PD symptom counts (with the exception of schizoid and obsessive-compulsive PD) as assessed with the Structured Clinical Interview for *DSM-IV* Axis II Disorders—

Personality Questionnaire (SCID-II-PQ; First, Gibbon, Spitzer, Williams, & Benjamin, 1997).

This study

Despite these promising findings, no published study to date has considered MMPI-2-RF-specific PD spectra scales. Accordingly, our main goal was to ascertain if traditionally defined PD constructs can be represented as PD spectra constructed from the MMPI-2-RF item pool. This effort is detailed in two studies using four samples. The first study focused on the development and initial validation of PD scales with items that function effectively across different populations and the second study examined the broader issue of construct validity in a clinical sample.

We assumed that developing MMPI-2-RF PD spectra scales has merit in that such spectra, although incorporating a degree of artefactual “co-morbidity,” would carry communicative value with practicing clinicians and clinical traditions. The MMPI-2 is the most frequently used and taught personality inventory (Camara, Nathan, & Puente, 2000; Mihura et al., 2017; Ready & Veague, 2014), with the MMPI-2-RF use rapidly growing and currently accounting for half of MMPI sales (Ben-Porath, 2016). PD spectra scales could complement MMPI-2-RF PSY-5 constructs while importing a degree of intrinsic clinical utility (Mullins-Sweat & Widiger, 2009) insofar as they conform to common practices in diagnostic formulation. In this way, there are parallels to the hybrid-categorical diagnosis of the DSM-5, Section III AMPD. We hope that linking categorical and dimensional representation of PD diagnosis can serve as a stepping stone to increasing use of dimensional approaches (Widiger, Costa, & McCrae, 2002), in addition to the practical value of these PD spectra scales for current clinical practice.

Study 1

The first study aimed to describe the development and initial validation of the MMPI-2-RF PD scales. We took a step-wise approach to development in which we focused on attaining a good balance of psychometric properties (content validity, internal consistency reliability, discriminant validity). We also tested for initial convergent, discriminant, and incremental validity. More specifically, we examined correlations with self-reported PD symptoms as well as the personality trait model featured in the DSM-5 AMPD listed in Section III. Such analyses would not only provide for good criterion-related and construct-related validity evidence, but also show how these scales can indeed serve as a potential bridge across two systems of personality pathology. We also examined incremental validity against the PSY-5 scales, which are the current MMPI-2-RF scales purported to assess personality pathology. As such, these scales would represent an important comparison with respect to incremental validity.

We hypothesized that each MMPI-2-RF PD spectrum scale would correlate meaningfully with its corresponding PD on an external criterion measure, and less strongly with other noncorresponding PD scales. In terms of traits from the DSM-5 AMPD, we expected that each of the PD scales would correlate

most substantially with those traits assigned to the disorder in question in the DSM-5 AMPD. For the four PDs not listed in the DSM-5 AMPD (paranoid, schizoid, histrionic, and dependent) we used a cross-walk initially published on the DSM-5 Web site (see Hopwood, Thomas, Markon, Wright, & Krueger, 2012), with one exception. For histrionic PD, we added hypotheses for (low) withdrawal and (low) anhedonia in light of extensive empirical evidence that its most substantial correlation is typically with the extraversion domain and corresponding facets (Samuel & Widiger, 2008).

Method

Participants

We used four samples in this study. The MMPI-2-RF normative sample ($n = 2,214$), a student sample ($n = 637$) from a southeastern U.S. university, and an outpatient mental health sample ($n = 895$) were used for internal consistency analyses and item-to-scale correlations for purposes of scale refinement. These samples and associated data collection procedures have all been described in detail elsewhere (e.g., Anderson & Sellbom, 2015; Anderson et al., 2013; Ben-Porath & Tellegen, 2008 [normative sample]; Graham, Ben-Porath, & McNulty, 1999; Sellbom et al., 2012 [outpatient sample]; Sellbom & Smith, 2017 [university sample]). For descriptive statistics of the final PD spectra scales, we also reported on a large prison sample ($n = 41,893$; see, e.g., Sellbom, 2016, for specific details). All final numbers were calculated after invalid MMPI-2-RF protocols have been excluded per standard validity scale cutoffs (Cannot Say [CNS] ≥ 15 , Variable Response Inconsistency [VRIN-r]; True Response Inconsistency [TRIN-r] $T \geq 80$, Infrequent Responses [F-r] = 120, Infrequent Psychopathological Responses [Fp-r] $T \geq 100$; see Ben-Porath & Tellegen, 2008/2011). Table 1 lists the basic demographic characteristics for each sample.

Measures

Minnesota Multiphasic Personality Inventory-2 Restructured Form. The MMPI-2-RF is a 338-item, true-false format, self-report inventory derived from the MMPI-2 item pool to assess personality and psychopathology. Items aggregate onto nine validity indicators, three higher order (HO) scales, nine restructured clinical (RC) scales, 23 specific problems (SP) scales, two

Table 1. Demographic information for four samples used in Study 1.

	Normative/ community ($n = 2,214$)	University ($n = 637$)	Mental health ($n = 894$)	Prison ($n = 41,893$)
Sex				
Men	49.6%	44.3%	38.7%	82.7%
Women	50.4%	55.7%	61.3%	17.3%
Age				
M	41.24	19.36	33.02	29.51
SD	15.27	1.64	10.22	8.34
Race/ethnicity				
White	76%	75%	81%	45%
African American	10%	16%	17%	54%
Other or mixed	14%	9%	2%	1%

interest scales, and five revised Personality Psychopathology Five (PSY-5) scales. All MMPI-2-RF scales were scored from MMPI-2 administrations in the normative, clinical, and correctional samples. The PSY-5 scales were used in this study for the university sample incremental validity analyses. Internal consistency (coefficient alpha) values for the PSY-5 scales were: .73 (Aggressiveness [AGGR-r]), .68 (Psychoticism [PSYC-r]), .76 (Disconstraint [DISC-r]), .73 (Neuroticism/Negative Emotionality [NEGE-r]), and .79 (Introversion/Low Positive Emotionality [INTR-r]) in the university sample.

Structured Clinical Interview for the DSM-IV Axis II Disorders–Personality Questionnaire. The SCID-II-PQ (First et al., 1997) is a well-established, 119-item, self-report screening questionnaire (for the SCID-II) that measures symptoms associated with diagnostic criteria for 10 personality disorders in the DSM-IV/DSM-5 Section II on a scale of 0 (*absent or false*) to 1 (*threshold or true*). We scored each PD scale as symptom counts to maximize variability. Internal consistency (coefficient alpha) for each disorder symptom count ranged from .56 (obsessive-compulsive PD) to .75 (antisocial and borderline PDs), with a median of .66.

Personality Inventory for DSM-5. The Personality Inventory for DSM-5 (PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012) is a well-established self-report inventory for the DSM-5 AMPD trait model in Section III. It contains 220 items, which are responded to on a 4-point scale. The items aggregate onto 25 narrow-band personality trait facets, which converge onto five higher-order trait domains (negative affectivity, detachment, antagonism, disinhibition, and psychoticism). The PID-5 has already been subject to numerous validation studies and results are generally supportive (e.g., Al-Dajani, Gralnick, & Bagby, 2016; Krueger & Markon, 2014). Internal consistency (coefficient alpha) for each PID-5 scale score ranged from .70 (irresponsibility) to .94 (eccentricity), with suspiciousness (.58) being the only facet to fall below the conventional benchmark of .70 for adequate reliability. However, the average interitem correlation for this seven-item facet was .18, which is acceptable (Clark & Watson, 1995).

Results and discussion

Scale construction

As stated earlier, we used a multistep approach to scale development that balanced sampling from the constructs of interest, content validity, convergent and discriminant concerns, external validity, and other item and scale properties (e.g., Clark & Watson, 1995; Loevinger, 1957; Morey, 1991; Tellegen et al., 2003). First, we examined the items from the MWB MMPI scales and the SBP MMPI-2 scales that remained on the MMPI-2-RF.¹ For each PD candidate scale, we combined the items from each set. We believed this combined item pool was a good starting point, as these

item sets reflected the efforts of two independent groups of scholars with documented expertise in both personality psychopathology and the MMPI. Second, we examined internal consistency, including corrected item-to-total correlations, and removed any item we deemed to seriously detract from the scales' internal consistency (e.g., crossing the street to avoid meeting someone they know [schizoid]; not speaking to others unless spoken to [schizotypal]; being about as smart as others [narcissistic]; but with an attempt at preserving content validity and specifically construct breadth; e.g., Loevinger, 1954). Third, we examined the item pools for each of the 10 prospective PD scales and removed item overlap by assigning any overlapping item to the scale we judged (based on consensus) best matched the PD in question. Fourth, we examined correlations between each item with its target scale as well as the nine other PD scales. Those items that clearly exhibited a larger correlation with a scale different from its target scale were removed (and considered for inclusion for the other scale in question should the item content be appropriate).

Next, a content validity examination of the overall item pools of each individual PD scale at this stage revealed that certain scales (schizoid, narcissistic, and obsessive-compulsive in particular) had restricted item content relative to their underlying conceptual constructs. The sixth step therefore involved each author independently surveying the remaining MMPI-2-RF items and assigning them (if conceptually indicated) to a particular PD. All items that had majority expert assignment to a particular PD were considered for further inclusion. Such items were ultimately included on a PD scale if they (a) did not substantially detract from internal consistency reliability (i.e., at a point deemed conceptually indefensible) and (b) were not substantially more strongly correlated with a different PD scale. The final item compositions for the 10 PD spectra scales appear in the Appendix.²

It is noteworthy that the 10 PD spectra scales exhibit relatively low item overlap with the MMPI-2-RF remnants of the previous PD scale sets (MWB and SBP) in light of these items serving as a foundation for the current sales (see Table S1). Also, the item overlap with the PSY-5 scales, which represent the current dimensional model of personality pathology on the MMPI-2-RF, ranged from 8% (obsessive-compulsive PD) to 68% (schizotypal PD), with a mean of 44% (see Table S1).

Descriptive statistics and psychometrics

We next examined the means, standard deviations, and internal consistency reliability (coefficient alpha) for the final 10 MMPI-2-RF PD spectra scales. These are listed in Table 2. The pattern of results emerged as expected; the community adults exhibited the lowest mean scores and variability, whereas the outpatient mental health sample generally scored the highest on most of the PDs, and the prison inmates had the highest scores on the antisocial PD scale. The university sample, however, did not conform fully to expectations. They scored

¹We elected to start with MWB and SBP scales because they represented the most dominant PD scale sets for the MMPI and MMPI-2, respectively, in the literature and were associated with the largest item pools.

²For copyright and test security reasons, we cannot print the item statements.

Table 2. Descriptive statistics and internal consistency reliability across samples.

	Normative/community (<i>n</i> = 2,214) ^a				University student (<i>n</i> = 637)			Outpatient mental health (<i>n</i> = 894)			Prison inmates (<i>n</i> = 41,893)		
	<i>M</i>	<i>SD</i>	α	Retest <i>r</i> ^b	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α
Paranoid	4.66	3.02	.72	.78	7.37	3.13	.72	7.37	3.97	.80	7.18	3.62	.78
Schizoid	3.46	2.44	.67	.86	2.35	2.34	.70	5.35	3.25	.77	3.46	2.59	.69
Schizotypal	2.72	2.75	.72	.82	5.18	3.54	.74	5.31	3.89	.78	4.17	3.63	.79
Antisocial	6.49	3.81	.76	.89	7.88	3.96	.76	9.00	4.46	.78	10.28	4.58	.80
Borderline	7.54	5.18	.84	.88	8.89	5.36	.82	15.37	7.12	.88	9.01	5.70	.85
Histrionic	10.28	3.06	.69	.87	11.64	2.95	.73	8.56	3.67	.78	10.57	3.02	.69
Narcissistic	10.90	2.97	.60	.79	12.45	3.06	.64	9.63	3.22	.63	12.43	2.79	.60
Avoidant	5.66	3.71	.81	.91	5.14	3.81	.82	7.99	4.32	.86	5.03	3.65	.80
Dependent	5.02	3.87	.80	.86	6.65	3.86	.78	8.97	4.81	.83	5.53	3.47	.75
Obsessive-compulsive	3.53	2.30	.62	.78	5.42	2.46	.61	5.50	2.56	.67	3.91	2.40	.65

Note. Retest = test-retest reliability.

^aThese should not be used as the formal normative data for these scales as the sample represents a subset of the normative sample with valid MMPI-2-RF profiles. The University of Minnesota Press must be contacted for permission to obtain normative data

^b*n* = 192 (MMPI-2 normative test-retest subsample).

particularly high on histrionic and narcissistic PDs and comparably on paranoid, schizotypal, and obsessive-compulsive compared to the more pathological samples. Although these elevated scores might be due to deviant responding³ or lack of psychological maturity in young adults (Roberts, Wood, & Caspi, 2008), it is also worth noting that obsessive-compulsive PD prevalence rates are the highest in younger and more educated community adults compared to the rest of the U.S. population (Grant et al., 2004).

Internal consistency reliability values ranged from .60 (narcissistic) to .84 (borderline) with a median of .72 in the normative sample; .61 (obsessive-compulsive) to .82 (borderline and avoidant) with a median of .74 in the university sample; .63 (narcissistic) to .88 (borderline) with a median of .78 in the outpatient mental health sample; and .60 (narcissistic) to .85 (borderline) with a median of .77 in the prison sample. Thus, not surprisingly, greater reliability was observed in the more pathological samples.

Test-retest reliability was examined in a subset of the original MMPI-2 normative sample (*n* = 193) who were administered the test 1 week apart. These values are listed in Table 2, and they were substantially larger than their corresponding internal consistency coefficients, ranging from .78 (paranoid and obsessive-compulsive) to .91 (avoidant) with a median of .86.

We also examined the intercorrelations among MMPI-2-RF PD spectra scales across samples. These values ranged from -.68 (schizoid and histrionic) to .62 (borderline and obsessive-compulsive) with a median of .32 (absolute correlation magnitude) in the normative sample; -.71 (schizoid and histrionic) to .61 (borderline and paranoid) with a median of .31 in the university sample; -.80 (schizoid and histrionic) to .68 (avoidant and dependent) with a median of .35 in the mental health sample; and -.73 (schizoid and histrionic) to .67 (borderline and obsessive-compulsive) with a median of .35 in the prison

sample. The intercorrelation matrices were highly consistent ($ICC_{3,1} = .96$) across samples. Full details are available in Tables S2a-S2d.

Criterion, convergent, and discriminant validity

In terms of criterion-related validity, we examined associations between MMPI-2-RF PD scales and their counterparts on the SCID-II-PQ in a subset of the university sample (*n* = 397; see Anderson et al., 2013; Sellbom & Smith, 2017). These correlations are shown in Table 3. The majority of the MMPI-2-RF PD scales evinced large correlations with their respective SCID-II-PQ scales, whereas the correlations for antisocial, narcissistic, and obsessive-compulsive were moderate. Only the schizoid PD scale failed to reach a moderate correlation with its SCID-II-PQ counterpart scale ($r = .28$). There was also support for discriminant validity. The median discriminant correlation coefficient was significantly smaller compared with the convergent correlation coefficient for every PD (Fisher's $z_s > 1.80$, $ps < .05$, one-tailed). Nonetheless, there were some individual discriminant correlations worthy of highlighting. Specifically, schizoid PD exhibited larger correlations with histrionic PD (negative) and a similar magnitude correlation with avoidant PD, which is clearly a reflection of the shared social avoidance variance. Indeed, avoidant and histrionic PDs were moderately negatively correlated as well. The discriminant correlations for obsessive-compulsive PD, however, were more surprising. This MMPI-2-RF scale was similarly correlated with paranoid, borderline, avoidant, and dependent PDs ($r_s = .42-.47$) correlations as with its SCID-II-PQ counterpart ($r = .44$), which is possibly a reflection of the high saturation of negative emotionality in the item content (e.g., several items come from the MMPI-2-RF stress/worry and inefficacy scales).

Next, we examined the correlations between the MMPI-2-RF PD scales and the PID-5 domain and facet scales in the university sample. These correlations appear in Table 4. By and large, most of the hypotheses (see bold type in Table 4) were supported. With one exception (obsessive-compulsive PD), all median convergent correlation

³It also bears mentioning that, despite attempts to control for inconsistent and deviant responding by excluding invalid profiles, the university students scored substantially higher than the normative sample on the Fp-r scale (57T vs. 50T) and in the same range as the outpatient sample with more severe psychopathology (57T vs. 56T). As such, it is quite possible that some of these surprising findings were due to greater levels of deviant responding than actual levels of personality psychopathology.

Table 3. Zero-order correlations between MMPI-2-RF PD scales and SCID-II-PQ PD scales.

SCID-II-PQ	MMPI-2-RF									
	PPD	ScPD	SzPD	AsPD	BPD	HPD	NPD	AvPD	DPD	OCPD
Paranoid	.56	.06	.48	.27	.49	-.04	.18	.32	.39	.47
Schizoid	.26	.28	.32	.10	.29	-.23	-.01	.26	.25	.30
Schizotypal	.37	.06	.53	.17	.39	.02	.09	.15	.34	.33
Antisocial	.41	-.14	.36	.39	.30	.19	.30	.02	.13	.25
Borderline	.46	.02	.51	.37	.61	.08	.11	.25	.43	.45
Histrionic	.21	-.42	.21	.31	.18	.52	.30	-.26	.13	.10
Narcissistic	.46	-.16	.38	.30	.35	.22	.32	.05	.27	.31
Avoidant	.25	.30	.22	.03	.36	-.43	-.20	.70	.55	.46
Dependent	.29	.01	.30	.17	.37	.00	-.03	.28	.58	.42
Obsessive-compulsive	.37	.08	.28	.09	.33	-.06	.20	.26	.21	.44
Mdn discriminant <i>r</i>	.37	.08	.32	.17	.35	.08	.18	.26	.27	.33

Note. $N = 397$. An absolute correlation magnitude of .20 is statistically significant at an alpha of .001. Hypothesized correlations are shown in bold. MMPI-2-RF = Minnesota Multiphasic Personality Inventory–Restructured Form; PD = personality disorder; SCID-II-PQ = Structured Clinical Interview for DSM-IV Axis II Disorders–Personality Questionnaire; PPD = paranoid personality disorder; ScPD = schizoid personality disorder; SzPD = schizotypal personality disorder; AsPD = antisocial personality disorder; BPD = borderline personality disorder; HPD = histrionic personality disorder; NPD = narcissistic personality disorder; AvPD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder; Mdn = median.

coefficients were in the moderate to large range, and this magnitude was significantly larger than the median discriminant correlations for these comparisons (Fisher's $z_s > 2.65$, $ps < .05$, one-tailed). The MMPI-2-RF obsessive-compulsive PD scale, however, evinced a small median convergent correlation coefficient, which was smaller than (albeit statistically nonsignificant, Fisher's $z = 1.35$, $p > .05$) the median

discriminant correlation. As such, the construct validity associated with the obsessive-compulsive PD scale is questionable, at least with respect to these summary statistics.

The convergent validity, although impressive in summary, warrants some further consideration. It is noteworthy that many of the MMPI-2-RF PD spectra scales correlate with PID-5 trait scales in ways that are consistent with other Section

Table 4. Correlations between MMPI-2-RF PD and PID-5 domain and facet scales.

	PPD	ScPD	SzPD	AsPD	BPD	HPD	NPD	AvPD	DPD	OCPD
Negative affectivity	.41	.05	.43	.23	.62	-.06	-.07	.43	.59	.54
Anxiousness	.33	.19	.35	.07	.53	-.21	-.16	.46	.52	.53
Hostility	.46	.05	.31	.45	.52	.04	.18	.17	.18	.37
Emotional stability	.30	.01	.39	.16	.50	.00	-.01	.29	.44	.40
Perseveration	.36	.09	.42	.23	.48	-.09	-.04	.33	.49	.51
Submissiveness	.08	-.03	.08	-.01	.20	-.08	-.15	.28	.44	.23
Separation insecurity	.22	-.08	.24	.16	.37	.06	-.06	.26	.40	.33
Depressivity	.29	.32	.33	.20	.60	-.24	-.31	.43	.51	.36
Detachment	.33	.52	.34	.24	.50	-.41	-.21	.43	.39	.38
Anhedonia	.24	.49	.23	.15	.51	-.41	-.27	.47	.40	.32
Withdrawal	.23	.55	.25	.10	.37	-.55	-.20	.53	.34	.33
Intimacy avoidance	.09	.34	.16	.03	.16	-.25	-.12	.16	.16	.17
Restricted affectivity	.14	.30	.12	.22	.16	-.22	-.08	.10	.06	.12
Suspiciousness	.50	.19	.43	.35	.45	-.06	.07	.23	.30	.37
Antagonism	.44	-.11	.33	.56	.38	.27	.35	-.08	.06	.24
Attention seeking	.23	-.31	.21	.35	.20	.42	.31	-.21	.03	.15
Callousness	.42	-.12	.30	.56	.36	.04	.20	-.01	.01	.13
Deceitfulness	.39	-.02	.31	.55	.39	.17	.16	.04	.19	.23
Grandiosity	.29	-.10	.19	.28	.13	.19	.44	-.13	-.11	.11
Manipulativeness	.30	-.12	.22	.44	.20	.28	.28	-.16	-.01	.13
Disinhibition	.40	-.12	.45	.51	.47	.18	.09	.08	.32	.37
Impulsivity	.32	-.18	.33	.49	.35	.27	.14	-.07	.17	.20
Irresponsibility	.27	.01	.31	.43	.40	.04	-.05	.15	.34	.26
Risk taking	.15	-.29	.12	.52	.07	.37	.18	-.33	-.18	-.13
Distractibility	.26	.01	.41	.23	.41	.00	-.16	.27	.48	.42
Rigid perfectionism	.21	.08	.17	-.01	.20	-.09	.15	.19	.13	.33
Psychoticism	.44	.15	.62	.43	.51	-.02	.03	.19	.33	.42
Eccentricity	.35	.16	.46	.37	.44	-.05	-.03	.18	.28	.36
Perceptual dysreg	.43	.10	.62	.39	.50	.00	.03	.21	.37	.43
Unusual beliefs	.38	.11	.59	.38	.39	.01	.10	.11	.21	.31
Mdn convergent <i>r</i>	.42	.42	.45	.49	.50	.41	.38	.47	.48	.25
Mdn discriminant <i>r</i>	.29	.10	.30	.21	.38	.09	.15	.19	.19	.32

Note. $N = 637$. An absolute correlation magnitude of .13 is statistically significant at an alpha of .001. Hypothesized correlations are shown in bold. MMPI-2-RF = Minnesota Multiphasic Personality Inventory–Restructured Form; PD = personality disorder; PID-5 = Personality Inventory for DSM-5; PPD = paranoid personality disorder; ScPD = schizoid personality disorder; SzPD = schizotypal personality disorder; AsPD = antisocial personality disorder; BPD = borderline personality disorder; HPD = histrionic personality disorder; NPD = narcissistic personality disorder; AvPD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder; Mdn = median.

II PD measures (e.g., Bach, Anderson, & Simonsen, 2016; Hopwood et al., 2012; Yam & Simms, 2014), including the SCID-II-PQ used in this study (Anderson, Snider, Sellbom, Krueger, & Hopwood, 2014). For instance, schizotypal PD has not been shown to be meaningfully associated with intimacy avoidance or restricted affectivity (e.g., Anderson et al., 2014; Bach et al., 2016; Yam & Simms, 2014; cf. Hopwood et al., 2012), which are also not the traits deemed most conceptually relevant to the disorder (American Psychiatric Association, 2013). Borderline PD was not meaningfully associated with risk taking, which has also been observed in previous research (e.g., Anderson et al., 2014; Bach & Sellbom, 2016; Hopwood et al., 2012; Yam, & Simms, 2014). Furthermore, avoidant PD has consistently shown evidence that it is not related to intimacy avoidance, at least as strongly as with other core traits (e.g., Anderson et al., 2014; Bach et al., 2016; Hopwood et al., 2012; Yam & Simms, 2014). Finally, obsessive-compulsive PD research has questioned the relevance of intimacy avoidance and restricted affectivity to this PD (e.g., Anderson et al., 2014; Bach et al., 2016; Hopwood et al., 2012; Liggett, Sellbom, & Carmichael, 2017; Yam & Simms, 2014). If all of these traits were excluded from consideration as convergent criteria, then the convergent validity would appear even more impressive, especially in that virtually all individual hypothesized correlations would be of at least a moderate effect size magnitude (i.e., $r \geq .30$).

The discriminant validity was generally good for most MMPI-2-RF PD spectra scales, but this issue merits some discussion for three scales. The schizotypal PD scale evinced particularly high correlations with distractibility ($r = .41$) and perseveration ($r = .42$) and more generally with negative affectivity traits (see, e.g., Hopwood et al., 2012, for similar results). These results are consistent with findings from the descriptive, psychometric, and experimental study of schizotypy and schizotypal PD. Research generally implicates “positive” and “negative” symptom problems in schizotypal PD; these include cognitive factors, manifest distress, and anhedonia (e.g., Ecklad & Chapman, 1983; Kwapil, Barrentes-Vidal, & Silvia, 2008). Borderline PD was associated with the largest median discriminant correlation coefficient, which is not surprising for a scale whose underlying construct has been repeatedly criticized for its extreme heterogeneity (e.g., Tyrer, 2009). Additionally, recent work has indicated that borderline PD criteria might reflect a general personality dysfunction severity factor (Sharp et al., 2015). Thus, the finding that the borderline PD scale showed substantial PD-wide associations is consistent with this point of view. It is also noteworthy that borderline PD is not linked to suspiciousness ($r = .45$) and cognitive and perceptual dysregulation ($r = .50$) in the DSM-5 Section III (American Psychiatric Association, 2013) despite both conceptual and empirical arguments for these links (Bach & Sellbom, 2016; Sellbom, Sansone, Songer, & Anderson, 2014). This underrepresentation of suspiciousness, perceptual dysregulation, and “anhedonic-like” states (emotional pain and dissociation leading to nonsuicidal self-harm; Zanarini & Frankenburg, 2007) in the Section III algorithm for borderline PD has also been noted as problematic by others (Evans & Simms, 2017). Finally, obsessive-compulsive PD had particularly questionable discriminant validity, which seemed to be a product of high correlations with negative affectivity traits. As indicated earlier, this finding likely

relates to the item content of this scale. Nevertheless, this pattern of discriminant validity coefficients, at least from the perspective of the DSM-5 AMPD, is hardly unique to the MMPI-2-RF obsessive-compulsive PD scale (e.g., Anderson et al., 2014; Hopwood et al., 2012; Liggett et al., 2017).

Incremental validity

Finally, we examined the incremental validity of the MMPI-2-RF PD scales in predicting SCID-II-PQ symptom counts in the university sample. We selected the PSY-5 scales as predictors in a first step, as these are conceptually viewed as general domains of personality pathology on the MMPI-2-RF and correspond to the same five broad domains as the DSM-5 AMPD (e.g., Anderson et al., 2013). In the second step of each model, we entered the PD scale. Our only objective was to examine whether the PD spectra scales would provide additional information above and beyond the PSY-5 scales; individual parameters were not examined. In light of SCID-II-PQ scores representing count data, we estimated a negative binomial regression model by default. If the variance-to-mean overdispersion parameter was not statistically significant, the negative binomial model was automatically reverted to a Poisson model. The selected standard count model (negative binomial/Poisson) was also compared to a zero-inflated counterpart via the Vuong likelihood ratio test, and if significant, the zero-inflated model was preferred. The selected parameterization for each SCID-II-PQ PD criterion variable is indicated in Table 5. Nested models were evaluated using a likelihood ratio test. The results for the 10 individual models are shown in Table 5. As evident from Table 5, 9 of the 10 PD scales significantly incremented the PSY-5 scale scores in these predictions; the lone exception was schizoid PD. The latter is not surprising in light of its modest convergent correlation with the SCID-II-PQ schizoid scale.

Another way to consider relative utility is parsimony in prediction. The PSY-5 scales will be associated with greater predictive utility in absolute compared to the PD scale

Table 5. Negative binomial regression analyses predicting SCID-II-PQ PD count scores.

SCID-II-PQ	Step 1:	Step 2:		BIC		Δ BIC
	χ^2 PSY-5	$\Delta\chi^2$ PD	p	PSY-5	PD	
Paranoid	158.15	35.66	< .001	-971	-986	-15
Schizoid	94.01	0.08	.782	-1,056	-1,024	32
Schizotypal	126.25	7.86	.019 ^a	-1,229 ^a	-1,267 ^a	-38
Antisocial	105.26	4.85	.027	-1,096	-1,089 ^a	7
Borderline	203.27	28.00	< .001	-894	-911	-17
Histrionic	126.55	24.09	< .001 ^b	-827 ^b	-849 ^b	-22
Narcissistic	133.88	5.42	.019 ^b	-635 ^b	-590 ^b	45
Avoidant	144.77	118.15	< .001 ^c	-856 ^a	-1,004 ^b	-148
Dependent	116.38	71.93	< .001 ^c	-922 ^c	-1,027 ^b	-105
Obsessive-compulsive	82.80	16.50	< .001 ^b	-742 ^b	-752 ^b	-10

Note. SCID-II-PQ = Structured Clinical Interview for DSM-IV Axis II Disorders–Personality Questionnaire; PSY-5 = Personality Psychopathology Five scales; PD = MMPI-2-RF Personality Disorder scales; BIC = Bayesian information criterion. All Step 1 values were statistically significant ($p < .001$).

^aZero-inflated negative binomial model (Vuong test, $p < .05$); ^bPoisson model (overdispersion parameter [α] $p > .05$); ^cZero-inflated Poisson model (Vuong test, $p < .05$).

given the presence of five predictors to one; however, the models can also consider parsimony in light of relative model fit. One method of doing so is via the Bayesian information criterion (BIC), with lower BIC values being associated with greater relative fit. BIC differences of 2–5, 6–9, and 10 for two nonnested models are associated with positive, strong, and very strong evidence, respectively (Raftery, 1995). For instance, a BIC difference of 10 is associated with factor odds of 150:1 that the model with the lower BIC value is the better fitting model. For each PD, we compared the PSY-5 prediction model to one in which a singular MMPI-2-RF PD scale was used as the predictor. Again, as with the nested regression models, for each individual model (PSY-5 and singular PD spectra scale), the statistically supported parameterization was selected. The results appear in Table 5 and indicate that 7 of 10 MMPI-2-RF PD scales outperformed the PSY-5 scales when accounting for parsimony in prediction. These results are impressive given that the PSY-5 model has five times as many predictors (i.e., five scales) and can therefore account for a large amount of variability in PD symptom counts relative to a singular scale. Moreover, it is not surprising that schizoid, antisocial, and narcissistic PDs were the exceptions, as these three scales were associated with the smallest correlations with their respective SCID-II-PQ counterparts.

Study 2

The second study was designed to elaborate on the broader construct validity of the MMPI-2-RF PD spectra scales in a large clinical sample. More specifically, we used the same outpatient mental health sample as in Study 1 and considered two broad sources of extratest criteria: psychosocial history data and therapists' ratings. We selected items representative of mental health care utilization, criminal history, alcohol and drug abuse, aggression, abuse history, and suicide attempts given their centrality to clinical assessment concerns in PD. Moreover, we examined whether therapists' ratings of clients (blind to MMPI results) on a number of variables relevant to PDs would relate to scores on MMPI-2-RF PD scales in manners that would be conceptually indicated. We did not state a

priori hypotheses, but did conceptually expect that the more "internalizing" PDs would be related to abuse histories, suicide attempts, and mental health care utilization, whereas the more "externalizing" PDs (e.g., antisocial) would be associated with externalizing behavior and ratings of anger, aggression, family problems, and work- and other performance-based problems.

Method

Participants and procedures

We used the same outpatient mental health sample as in Study 1. This sample consisted of 410 male and 610 female outpatients from a community mental health center. This sample has been described in considerable detail elsewhere (Graham et al., 1999). Participants were administered the MMPI-2 after extensive intake procedures, which included an interview and in some cases additional diagnostic testing. Clinicians completed the intake form after the intake interview and were blind to MMPI-2 results at that time. Clients were subsequently referred to therapists for services. Application of standard MMPI-2-RF exclusionary criteria (Ben-Porath & Tellegen, 2008/2011) resulted in a final sample of 346 men and 548 women (12.2% excluded). Basic demographics were shown in Table 1. In addition, approximately half of the participants had previous outpatient treatment, and the most common Axis I diagnoses determined by clinician-generated diagnoses were adjustment disorders (32%), depression (24%), and anxiety disorders (17%).

Measures

MMPI-2. The original MMPI-2 was administered in this sample from which MMPI-2-RF administrations were scored. More specifically, we scored the 10 PD scales. Descriptive statistics and reliability information has already been shown for this sample in Study 1 (see Table 2).

Intake form. The intake form was completed by a trained clinician after an extensive clinical interview with the client participant. The form includes demographics, mental health history, substance abuse history, diagnostic impression, and ratings on a variety of mental status variables, such as orientation,

Table 6. Correlations between MMPI-2-RF PD scales and intake variables in the mental health sample.

	PPD	ScPD	SzPD	AsPD	BPD	HPD	NPD	AvPD	DPD	OCPD
Lifetime alcohol abuse	.04	-.04	.10	.38	.10	.07	.06	-.01	.00	.07
Lifetime drug abuse	.06	-.05	.16	.41	.13	.12	.06	-.05	-.04	.05
Criminal history severity	.06	.03	.02	.27	-.02	.00	.05	-.05	-.06	-.03
Previous mental health care utilization	.07	.08	.12	.08	.17	-.10	-.14	.15	.18	.15
History of being sexually abused	.11	.08	.21	.10	.18	-.07	-.08	.14	.15	.15
History of being physically abusive	.15	.03	.06	.24	.10	.01	.06	-.03	-.02	.05
History of committing domestic violence	.08	.00	.03	.21	.06	.03	.11	-.03	-.06	.03
History of victim of domestic violence	.08	.05	.09	-.04	.09	-.07	-.07	.08	.10	.13
History of being physically abused	.15	.07	.16	.12	.20	-.07	-.07	.15	.11	.17
History of previous suicide attempts	.13	.08	.19	.20	.29	-.09	-.16	.18	.20	.13
Number of previous suicide attempts	.13	.05	.18	.12	.22	-.06	-.10	.13	.15	.11

Note. Absolute correlation magnitudes of .15 or larger are shown in bold. MMPI-2-RF = Minnesota Multiphasic Personality Disorder-2 Restructured Form; PD = personality disorder; PPD = paranoid personality disorder; ScPD = schizoid personality disorder; SzPD = schizotypal personality disorder; AsPD = antisocial personality disorder; BPD = borderline personality disorder; HPD = histrionic personality disorder; NPD = narcissistic personality disorder; AvPD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder.

Table 7. Correlations between MMPI-2-RF PD scales and therapist ratings in the mental health sample.

	PPD	ScPD	SzPD	AsPD	BPD	HPD	NPD	AvPD	DPD	OCPD
Angry resentment	.15	.14	.11	.26	.22	-.08	-.06	.06	.02	.11
Critical/argumentative	.09	.11	.07	.28	.17	-.04	-.02	.02	-.01	.07
Narcissistic	.06	-.04	.05	.28	.00	.16	.15	-.15	-.16	-.01
Histrionic	.12	.03	.17	.19	.26	.02	-.07	.07	.08	.21
Aggressive	.10	.02	.00	.38	.08	.05	.09	-.12	-.17	.00
Insecure	.07	.17	.18	.10	.32	-.21	-.26	.29	.26	.20
Anxious	.10	.23	.23	.05	.28	-.26	-.26	.27	.25	.23
Pessimistic	.10	.26	.15	.12	.22	-.20	-.17	.14	.12	.12
Depressed	.13	.31	.25	.08	.43	-.29	-.29	.34	.30	.28
Achievement oriented	-.23	-.22	-.19	.05	-.17	.28	.20	-.22	-.24	-.16
Passive—submissive	.04	.11	.13	-.16	.12	-.21	-.27	.26	.29	.16
Introverted	.08	.25	.10	.05	.13	-.34	-.24	.28	.17	.07
Antisocial	.10	-.02	.05	.34	.02	.09	.11	-.12	-.16	-.03
Family problems	.11	.06	.10	.19	.24	-.05	-.10	.09	.07	.14
Obsessive—compulsive	.03	.12	.12	.13	.17	-.11	-.12	.16	.09	.13
Procrastinates	.00	.03	.15	.19	.11	.00	-.03	.07	.03	.15
Suspicious	.12	.15	.13	.24	.12	-.11	-.06	.07	-.01	.06
Agitated	.09	.15	.14	.17	.19	-.10	-.07	.05	.03	.12
Work problems	.14	.09	.10	.23	.16	-.01	.03	.04	.03	.10

Note. The *ns* associated with PDF scales vary because of missing ratings (range = 317–604, with 17 scales $n > 500$). Absolute correlation magnitudes of .15 or larger are shown in bold. MMPI-2-RF = Minnesota Multiphasic Personality Disorder-2 Restructured Form; PD = personality disorder; PPD = paranoid personality disorder; ScPD = schizoid personality disorder; SzPD = schizotypal personality disorder; AsPD = antisocial personality disorder; BPD = borderline personality disorder; HPD = histrionic personality disorder; NPD = narcissistic personality disorder; AvPD = avoidant personality disorder; DPD = dependent personality disorder; OCPD = obsessive-compulsive personality disorder.

memory, mood, and anxiety. For purposes of this study, we selected psychosocial history variables with direct conceptual relevance to personality disorders (see Table 6). The history variables were binary (i.e., yes or no), substance use variables were ordinal (rated on a 0 [*no use*] to 5 [*definite abuse*] scale) and ratings were averaged across types of substances used, and mental health care utilization and criminal history were aggregates of multiple variables pertaining to each category and each formed a continuous score.

Patient description form. After the third therapy session had been completed, and before reviewing the MMPI-2 results, the therapist completed the patient description form (PDF; Graham, Ben-Porath, & McNulty, 1999), a 188-item rating form composed of personality and symptomatic characteristics culled from the MMPI-2 interpretative literature.⁴ The median time between MMPI-2 administration and third session ratings was 38 days. The items of the PDF are grouped into 25 scales established through factor analysis (Graham et al., 1999). In this study, six scales were excluded because of extreme range restriction, poor reliability, or being conceptually irrelevant to any of the PDs. The remaining 19 scales are listed in Table 7. Therapists rated participants on each of these items using a 5-point scale (*not at all*, *slight*, *moderate*, *high*, and *very high*). Owing to practical limitations in this setting, including the fact that therapists rated their individual clients after three sessions with no opportunity for videotaping or a second rater otherwise observing the participant, we were unable to calculate interrater reliability. However, Graham et al. (1999) reported internal

consistencies for these scales ranging from .69 to .92 (Mdn = .87) for men and .72 to .93 (Mdn = .87) for women.

Results and discussion

We calculated zero-order correlations between the MMPI-2-RF PD scales and the psychosocial history variables coded from the intake form (see Table 6) and the PDF scales (see Table 7). We used Pearson correlations for continuous variables and point biserial correlations for binary variables. An absolute correlation magnitude of .15 and larger, which would meet a conservative criterion for statistical significance in this sample ($p < .001$), was deemed clinically meaningful for two reasons. First, the criterion measures are associated with unknown interrater reliability and the PDF ratings were also gathered on average over a month after the MMPI-2 administrations. As such, validity coefficients are likely attenuated due to potential interrater reliability and (in the case of the PDF) temporal instability effects that would be less concerning in a fully cross-sectional study using other self-report measures as criteria for which medium effect sizes and beyond are typically viewed as meaningful. Second, a review of the pattern of associations of previous MMPI-2/MMPI-2-RF publications with this data set (e.g., Graham et al., 1999; Tellegen & Ben-Porath, 2008) indicated that a meaningful pattern of findings tends to emerge at this benchmark.

In terms of the psychosocial history variables, paranoid PD was specifically associated with a history of being physically abused as well as being physically abusive, which is consistent with the anger proneness associated with this PD as well as potential developmental trajectories associated with the hostile attribution bias (Sellbom, Bach, & Huxley, 2018). PD scales of a more “internalizing” nature (i.e., borderline, avoidant, dependent, and obsessive-compulsive) were all associated with previous mental health care utilization, physical and sexual abuse histories, and histories of suicide attempts (except obsessive-

⁴About two thirds of clients in this sample had PDF data given that not all clients had three therapy sessions. Because of missing ratings (mostly owing to clinicians marking unknown), the sample sizes ranged from 317 (work problems) to 604 (introverted). Seventeen of the 19 rating variables used in this study had ratings for more than 500 participants.

compulsive). Schizotypal PD evinced a similar pattern, except this scale was not associated with previous mental health care utilization. Antisocial PD was specifically associated with both lifetime alcohol and drug abuse, criminal history, physical aggression, but also history of suicide attempts. The narcissistic PD scale was negatively associated with a history of suicide attempts. Schizoid and histrionic PD scales were not associated with any of these variables, which is not necessarily unexpected or counterintuitive, especially in light of the very limited knowledge concerning the development of these PDs (e.g., Blashfield & Intoccia, 2000; Hopwood & Thomas, 2012).

Table 7 shows the correlations between the MMPI-2-RF PD scales and the therapists' ratings. The pattern of correlations was generally consistent with what would be expected given the underlying PD constructs. For instance, paranoid PD was associated with ratings of anger and resentment; schizoid PD with ratings of being introverted, pessimistic, and depressed; schizotypal PD with a range of internalizing symptoms; and antisocial PD with ratings of being antisocial, angry, and aggressive, and other forms of behavioral problems. The "internalizing" PDs showed a similar pattern of being associated with ratings of various depression and anxiety symptoms as well as being insecure and having low achievement orientation. Borderline PD was also associated with ratings of being angry, resentful, and argumentative, as well as having family problems. Histrionic and narcissistic PD scales were negatively associated with ratings of various internalizing symptoms and both associated with ratings of being narcissistic, achievement oriented, extraverted, and dominant or assertive (cf. passive-submissive correlations).

There were a few associations between MMPI-2-RF PD scales and therapists' ratings that were particularly surprising. First, although the correlation between paranoid PD and suspicious was statistically significant ($p = .002$), it did not meet the a priori benchmark for clinical meaningfulness. This pattern has been observed for many other MMPI-2/MMPI-2-RF scales that measure paranoia as well with this particular PDF scale (Graham et al., 1999; Tellegen & Ben-Porath, 2008). Indeed, ratings of suspiciousness in this sample tend to correlate consistently with various measures of antisociality and externalizing. Moreover, the null correlation between histrionic PD and ratings of "histrionic" also struck us as counterintuitive. However, an examination of the correlation pattern associated with this therapists' rating scale and the other PD scales (as well as other MMPI-2/MMPI-2-RF scales; Graham et al., 1999; Tellegen & Ben-Porath, 2008) indicates that therapists might have been associating "histrionic" with emotional instability more so than the dramatic and attention-seeking interpersonal style associated with this PD. Finally, the correlation ($r = .13$, $p = .003$) between the obsessive-compulsive PD scale and ratings of obsessive-compulsive was smaller than expected; however, it is likely that the therapists were considering obsessions and compulsions germane to obsessive-compulsive disorder rather than the personality style associated with the obsessive-compulsive PD construct. Nevertheless, more research is necessary for further validation of these scales in mental health settings.

General discussion

This investigation aimed to develop and provide initial validity evidence for MMPI-2-RF PD spectra scales. Overall, we believe

that this objective was met. The MMPI-2-RF PD spectra scales have good content validity (construct breadth), sufficient internal reliability in light of the expected construct heterogeneity, good temporal stability, and promising support for construct validity. Furthermore, we believe that the PD spectra scales live up to their names, in that they align very well with both traditional PDs and DSM-5 AMPD traits. Broader findings and implications for theory and assessment are discussed presently.

It is important to note that there were clear discrepancies in the relative validity coefficients associated with these PD spectra scales. These results probably reflect issues with respect to the traditional categorical spectrum concept as well as specifics of operationalization in these studies. Antisocial, schizoid, and narcissistic PDs did not evince overwhelming support in the criterion validity analyses and were the only scales not deemed to be more effective in capturing their corresponding PDs relative to the PSY-5 scales. However, it is also important to consider that these three scales exhibited arguably the strongest pattern of convergent and discriminant validity in relation to DSM-5 AMPD traits, in that all hypothesized traits exhibited at least moderate correlations, whereas the discriminant correlations were quite low. The antisocial PD scale, in particular, also evinced a promising pattern of convergent and discriminant validity in Study 2, with the other two scales generally being consistent with conceptual expectations as well. Perhaps the more negative findings are a reflection of the SCID-II-PQ more so than the PD, particularly because range restriction of such scores (at least for schizoid and antisocial) in a university sample would not be unexpected. Moreover, the SCID-II-PQ antisocial scale consists entirely of conduct disorder symptoms, and not surprisingly, the best predictor of this scale on the standard MMPI-2-RF is Juvenile Conduct Problems (Sellbom & Smith, 2017).

The MMPI-2-RF obsessive-compulsive PD spectra scale was arguably the most problematic in this investigation. Although convergent validity was generally promising (especially with SCID-II-PQ and PID-5 rigid perfectionism and perseveration), there were serious problems with discriminant validity. Across both studies, it is evident that the scale is strongly associated with negative affectivity and demoralization, even more so than would be conceptually indicated. As stated earlier, this association is in large part owing to many of the items being derived from internalizing MMPI-2-RF scales (RC7, NEGE-r, STW, NFC), and likely an absence of maladaptive perfectionism items on the instrument. As such, the obsessive-compulsive PD spectra scale would likely be better oriented toward the rigid, perseverating, and inefficacious interpersonal style more so than a maladaptive perfectionistic and morally bound disposition. Indeed, the highest convergent correlation was with PID-5 perseveration ($r = .51$). It is also worth noting that this effort might very well be the best possible with the MMPI-2-RF item pool. Our obsessive-compulsive PD scale outperformed the PSY-5 scales in predicting SCID-II-PQ obsessive-compulsive PD symptom counts, and no other individual MMPI-2-RF scale exhibits a higher correlation with this SCID-II-PQ scale (see Sellbom & Smith, 2017). Han, Weed, and McNeil (1996) also observed that the broader MMPI-2 item pool was also lacking in pure

conscientiousness markers, which at the extreme would possibly reflect some of these missing symptoms.

Finally, we need to consider the construct (or at least operationalizations) of obsessive-compulsive PD itself. Research using structured interviews or self-report scales often has not shown consistent dimensionality (Baer, 1994; Grillo, 2004) or a clear-cut pattern of convergent and discriminant validity with relevant scales and subscales (Ansell et al., 2010; Samuel & Widiger, 2010; Saulsman, & Page, 2004). This issue has been particularly salient when attempting to translate this construct into AMPD traits and impairment criteria (e.g., Hopwood et al., 2012; Liggett, Carmichael, Smith, & Sellbom, 2017). Complicating the matter further, efforts to disambiguate the subconstructs within obsessive-compulsive PD have found multiple specific dimensions from an FFM trait perspective (e.g., Samuel et al., 2012), with only some traits being specifically associated with SCID-II-PQ obsessive-compulsive PD. Thus, the traditional DSM syndrome of obsessive-compulsive PD is multidimensional, there is debate regarding which components are key, and the ability of the MMPI-2-RF item pool to capture this spectrum fully might be circumscribed.

Theoretical and practical implications

The research findings reported here have some broader implications with respect to the assessment of PD spectra. First, some readers might question the development of broader spectra measures altogether. Indeed, multiple, narrow-band, homogeneous construct scales in personality assessment are often recommended (Nunnally, 1962; Smith, McCarthy, & Zapolski, 2009; Tellegen et al., 2003). Yet, viewing personality constructs as kinds (categories) versus continua or spectra belies the subtlety that the category-dimension distinction itself might lie on a continuum (Borsboom et al., 2016; Wright, 2011). This issue also applies in biological taxonomy, and the pragmatic nature of the nosological construct is important to consider (Zacher, 2008). Moreover, Grucza and Goldberg (2007) found that many personality inventories show comparable criterion validity despite significant differences in scale construction strategy, and they recommended detailed examination of predictor and criterion relationships rather than global conclusions. Indeed, the MMPI-2-RF PD spectra scales here show quite promising convergent and discriminant validity.

There are also clinical utility advantages of considering PD spectra assessment. Clinical utility is an essential aspect of a diagnostic nosology and of diagnostic indicators, as it emphasizes ease of use, communication, and treatment planning (Mullins-Sweatt & Widiger, 2009). To the extent the MMPI-2-RF PD spectra scales reflect existing PD concepts, are consistent with clinical tradition, and retain continuity with lines of research on PD, they should be relatively easy to use, discuss, and employ in treatment planning. Thus, a degree of clinical utility is inherent in this approach. In addition, these scales would allow for direct assessment of PDs, if further validated, and other PD-specific self-report instruments might not be necessary, making the MMPI-2-RF a “one-stop shop” for psychopathology assessment. Moreover, there are multiple points of contact and cross-model connection between traditional

and dimensional conceptions of PD (Evans & Simms, 2017; Widiger et al., 2002). Therefore, as clinicians become more familiar and comfortable with dimensional conceptualizations, the MMPI-2-RF PD spectra scales could facilitate cross-model connections as well as transition to transdiagnostic models. Finally, as Chang (2017) argued with respect to the epistemic iteration of diagnostic models toward verisimilitude, multiple paradigmatic tracks are useful. In other words, there is utility clinically and scientifically in tracking cross-model connections alongside the emerging scientific paradigm in PD nosology (Zachar & Kendler, 2017). Wiggins (2003) also found value in pluralism and its interconnections in personality assessment. In other words, transdiagnostic models can coexist with traditional conceptions.

Limitations and future directions

There are at least two important limitations that merit discussion. First, Study 1 used a nonclinical university sample for initial validation, which has significant implications for the generalizability to clinical populations, as well as potentially introducing problems with range restriction and thereby attenuating important effects. University samples in particular consist of much younger individuals than the average treatment-seeking sample and an average age where personality (and associated psychopathology) is likely still in development (Roberts et al., 2008). Underlying psychological immaturity might have also influenced results (e.g., endorsement of more deviant items and thus higher mean scores).

In Study 2, the PDF used in the outpatient sample, albeit an innovative measure, is associated with unknown interrater reliability owing to practical constraints on the original data collection. Fortunately, internal consistency estimates for the PDF scale scores partially mitigate concerns about measurement error. Nevertheless, it is possible that some results were affected by idiosyncratic ratings and therefore replication is necessary.

It will be important to cross-validate the PD spectra scales using other PD measures and other dimensional trait-based approaches to PD. Cross-validation work should also include different types of settings and populations (e.g., mental health, correctional, forensic). More evidence regarding broader construct validity is important as well to get a clear picture of whether these scales share similar positions in the various nomological networks representing these PDs. Finally, it will be important to further elucidate important interpretive issues with respect to multiple PD spectra scale elevations, the role of comorbidity (with other PDs and other clinical symptoms), and thus, differential diagnosis.

Conclusion

This project is the first to develop PD spectra scales for the MMPI-2-RF and up-to-date methods that emphasized balancing important psychometric properties were used. Three large samples of different populations were considered in item retention and deletions. Two different types of samples with multi-method criterion variables were used for external validation.

This work led to 10 PD spectra scales for the MMPI-2-RF that can be used in applied practice to estimate scores on DSM-5 PD constructs and in research to further develop the bridge between categorical and dimensional approaches to personality pathology.

Acknowledgments

We thank Yossef Ben-Porath and John Graham for granting access to the clinical and correctional data sets used in this study. We are also grateful to the University of Minnesota Press for giving us permission to use the MMPI-2-RF normative sample and for providing research support for the original data collections. This article represents the opinion of Mark H. Waugh and not of the U.S. DOE, ORNL, or UT-Battelle, LLC, on work authored by UT-Battelle, LLC under Contract No. DE-AC05-00OR22725 with the U.S. Department of Energy.

Martin Sellbom is a paid consultant to the University of Minnesota Press, publisher of the MMPI-2-RF. He also teaches workshops and webinars on the MMPI-2-RF for remuneration. Finally, although funds were not directly requested for the current project, Dr. Sellbom does receive continuous funding for MMPI-2-RF research from the publisher.

References

- Al-Dajani, N., Gralnick, T. M., & Bagby, R. M. (2016). A psychometric review of the Personality Inventory for DSM-5 (PID-5): Current status and future directions. *Journal of Personality Assessment*, *98*, 62–81. doi:10.1080/00223891.2015.1107572
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing.
- Anderson, J. L., & Sellbom, M. (2015). Construct validity of the DSM-5 Section III personality trait profile for borderline personality disorder. *Journal of Personality Assessment*, *97*, 478–486. doi:10.1080/00223891.2015.1051226
- Anderson, J. L., Sellbom, M., Bagby, R. M., Quilty, L. C., Veltri, C. O. C., Markon, K. E., & Krueger, R. F. (2013). On the convergence between PSY-5 domains and PID-5 domains and facets: Implications for assessment of DSM-5 personality traits. *Assessment*, *20*, 286–294. doi:10.1177/1073191112471141
- Anderson, J. L., Sellbom, M., Pymont, C., Smid, W., De Saeger, H., & Kamphuis, J. H. (2015). Measurement of DSM-5 Section II personality disorder constructs using the MMPI-2-RF in clinical and forensic samples. *Psychological Assessment*, *27*, 786–800. doi:10.1037/pas0000103
- Anderson, J. L., Snider, S. K., Sellbom, M., Krueger, R. F., & Hopwood, C. J. (2014). A comparison of the DSM-5 Section II and Section III personality disorder structures. *Psychiatry Research*, *216*, 363–372. doi:10.1016/j.psychres.2014.01.007
- Ansell, E. B., Pinto, A., Crosby, R. D., Becker, D. F., Anez, L. M., Paris, M., & Grilo, C. M. (2010). The prevalence and structure of obsessive-compulsive personality disorder in Hispanic psychiatric outpatients. *Journal of Behavior Therapy and Experimental Psychiatry*, *41*, 275–281. doi:10.1016/j.jbtep.2010.02.005
- Appelbaum, P. S. (2017). DSM-5.1: Perspectives on continuous improvement in diagnostic frameworks. In K. S. Kendler & J. Parnas (Eds.), *Philosophical issues in psychiatry IV: Classification of psychiatric illness* (392–402). New York, NY: Oxford University Press.
- Bach, B., Anderson, J., & Simonsen, E. (2016). Continuity between interview-rated personality disorders and self-reported DSM-5 traits in a Danish psychiatric sample. *Personality Disorders: Theory, Research, and Treatment*. doi: 10.1037/per0000171.
- Bach, B., & Sellbom, M. (2016). Continuity between DSM-5 categorical criteria and traits criteria for borderline personality disorder. *The Canadian Journal of Psychiatry*, *61*, 489–494. doi:10.1177/0706743716640756
- Baer, L. (1994). Factor analysis of symptom subtypes of obsessive compulsive personality disorder and their relationship to personality and tic disorders. *Journal of Clinical Psychiatry*, *55*, 18–23.
- Ben-Porath, Y. S. (2016). An update and corrections to Williams and Lally's (2016) analysis of MMPI-2-RF acceptance. *Professional Psychology: Research and Practice*. doi:10.1037/pro0000115.
- Ben-Porath, Y. S., & Tellegen, A. (2011). *MMPI-2-RF: Manual for administration, scoring, and interpretation*. Minneapolis, MN: University of Minnesota Press. (Original work published 2008)
- Bernstein, D. P., Iscan, C., & Maser, J. (2007). Opinions of personality disorder experts regarding the DSM-IV personality disorders classification system. *Journal of Personality Disorders*, *21*, 536–551. doi:10.1521/pedi.2007.21.5.536
- Blais, M. A., Hilsenroth, M. J., Castlebury, F., Fowler, J. C., & Baity, M. R. (2001). Predicting DSM-IV Cluster B personality disorder criteria from MMPI-2 and Rorschach data: A test of incremental validity. *Journal of Personality Assessment*, *76*, 150–168. doi:10.1207/S15327752JPA7601_9
- Blashfield, R. K., & Intoccia, V. (2000). Growth of the literature on the topic of personality disorders. *American Journal of Psychiatry*, *157*, 472–473. doi:10.1176/appi.ajp.157.3.472
- Borsboom, D., Rhemtulla, M., Cramer, A. O. J., van der Maas, H. L. J., Scheffer, M., & Dolan, C. V. (2016). Kinds versus continua: A review of psychometric approaches to uncover the structure of psychiatric constructs. *Psychological Medicine*, *46*, 1567–1579. doi:10.1017/S0033291715001944
- Butcher, J. N., Graham, J. R., Ben-Porath, Y. S., Tellegen, A., Dahlstrom, W. G., & Kaemmer, B. (2001). *Minnesota Multiphasic Personality Inventory-2: Manual for administration and scoring* (2nd ed.). Minneapolis, MN: University of Minnesota Press.
- Camara, W. J., Nathan, J. S., & Puente, A. E. (2000). Psychological test usage: Implications in professional psychology. *Professional Psychology Research and Practice*, *31*, 141–154. doi:10.1037/0735-7028.31.2.141
- Cartwright, N. (1999). *The dappled world: A study of the boundaries of science*. Cambridge, UK: Cambridge University Press.
- Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., ... Moffitt, T. E. (2014). The p factor: One general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science*, *2*, 119–137. doi:10.1177/2167702613497473
- Chang, H. (2017). Epistemic iteration and natural kinds: Realism and pluralism in taxonomy. In K. S. Kendler & J. Parnas (Eds.), *Philosophical issues in psychiatry IV: Classification of psychiatric illness* (pp. 229–245). New York, NY: Oxford University Press.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*, 309–319. doi:10.1037/1040-3590.7.3.309
- Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, *41*, 417–440. doi:10.1146/annurev.ps.41.020190.002221
- Eckblad, M., & Chapman, L. J. (1983). Magical ideation as an indicator of schizotypy. *Journal of Consulting and Clinical Psychology*, *51*, 215–225. doi:10.1037/0022-006X.51.2.215
- Evans, C. M., & Simms, L. J. (2017). Assessing inter-model continuity between the Section II and Section III conceptualizations of borderline personality disorder in DSM-5. *Personality Disorders: Theory, Research, and Treatment*. Advanced online publication. doi: 10.1037/per0000243
- Finn, J. A., Arbis, P. A., Erbes, C. R., Polusny, M. A., & Thuras, P. (2014). The MMPI-2 restructured form personality psychopathology five scales: Bridging DSM-5 Section 2 personality disorders and DSM-5 Section 3 personality trait dimensions. *Journal of Personality Assessment*, *96*, 173–184. doi:10.1080/00223891.2013.866569
- First, M. B., Gibbon, M., Spitzer, R. L., Williams, J. B. W., & Benjamin, L. S. (1997). *Structured Clinical Interview for DSM-IV Axis I personality disorders (SCID-II)*. Washington, DC: American Psychiatric Press.
- Graham, J. R., Ben-Porath, Y. S., & McNulty, J. L. (1999). *MMPI-2 correlates for outpatient mental health settings*. Minneapolis, MN: University of Minnesota Press.

- Grant, B. F., Hasin, D. S., Stinson, F. S., Dawson, D. A., Chou, S. P., Ruan, W., & Pickering, R. P. (2004). Prevalence, correlates, and disability of personality disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, *65*, 948–958. doi:10.4088/JCP.v65n0711
- Greene, R. L. (2000). *The MMPI-2: An interpretive manual*. Needham Heights, MA: Allyn & Bacon.
- Gruzca, R. A., & Goldberg, L. R. (2007). The comparative validity of 11 modern personality inventories: Predictions of behavioral acts, informant reports, and clinical indicators. *Journal of Personality Assessment*, *89*, 167–187. doi:10.1080/00223890701468568
- Gunderson, J. G. (2010). Revising the borderline diagnosis for DSM-V: An alternative proposal. *Journal of Personality Disorders*, *24*, 694–708. doi:10.1521/pedi.2010.24.6.694
- Han, K., Weed, N. C., & McNeal, T. P. (1996). Searching for conscientiousness on the MMPI-2. *Journal of Personality Assessment*, *67*, 354–363. doi:10.1207/s15327752jpa6702_10
- Harkness, A. R., Finn, J. A., McNulty, J. L., & Shields, S. M. (2012). The Personality Psychopathology Five (PSY-5): Recent constructive replication and assessment literature review. *Psychological Assessment*, *24*, 432–443. doi:10.1037/a0025830
- Harkness, A. R., & McNulty, J. L. (1994). The Personality Psychopathology Five (PSY-5): Issue from the pages of a diagnostic manual instead of a dictionary. In S. Strack & M. Lorr (Eds.), *Differentiating normal and abnormal personality* (pp. 291–315). New York, NY: Springer.
- Harkness, A. R., McNulty, J. L., & Ben-Porath, Y. S. (1995). The Personality Psychopathology Five (PSY-5): Constructs and MMPI-2 scales. *Psychological Assessment*, *7*, 104. doi:10.1037/1040-3590.7.1.104
- Hathaway, S. R., & McKinley, J. C. (1943). *The Minnesota Multiphasic Personality Inventory*. Minneapolis, MN: University of Minnesota Press.
- Hicklin, J., & Widiger, T. A. (2000). Convergent validity of alternative MMPI-2 personality disorder scales. *Journal of Personality Assessment*, *75*, 502–518. doi:10.1207/S15327752JPA7503_10
- Hopwood, C. J., & Thomas, K. M. (2012). *Personality disorders* (6th ed.). In D. Beidel & M. Hersen (Eds.), *Adult psychopathology and diagnosis* (pp. 681–716). Hoboken, NJ: Wiley.
- Hopwood, C. J., Thomas, K. M., Markon, K. E., Wright, A. G., & Krueger, R. F. (2012). DSM-5 personality traits and DSM-IV personality disorders. *Journal of Abnormal Psychology*, *121*, 424. doi:10.1037/a0026656
- Jones, A. (2005). An examination of three sets of MMPI-2 personality disorder scales. *Journal of Personality Disorders*, *19*, 370. doi:10.1521/pedi.2005.19.4.370
- Kotov, R., Krueger, R. F., Watson, D., Achenbach, T. M., Althoff, R. R., Bagby, R. M., ... Zimmerman, M. (2017). The hierarchical taxonomy of psychopathology (HiTOP): A dimensional alternative to traditional nosologies. *Journal of Abnormal Psychology*, *126*(4), 454–477.
- Kotov, R., Ruggero, C. J., Krueger, R. F., Watson, D., Yuan, Q., & Zimmerman, M. (2011). New dimensions in the quantitative classification of mental illness. *Archives of General Psychiatry*, *68*, 1003–1011. doi:10.1001/archgenpsychiatry.2011.107
- Krueger, R. F., Derringer, J., Markon, K. E., Watson, D., & Skodol, A. E. (2012). Initial construction of a maladaptive personality trait model and inventory for DSM-5. *Psychological Medicine*, *42*, 1879–1890. doi:10.1017/S0033291711002674
- Krueger, R. F., & Markon, K. E. (2014). The role of the DSM-5 personality trait model in moving toward a quantitative and empirically based approach to classifying personality and psychopathology. *Annual Review of Clinical Psychology*, *10*, 477–501. doi:10.1146/annurev-clinpsy-032813-153732
- Krueger, R. F., Tackett, J. L., & MacDonald, A. (2016). Toward validation of a structural approach to conceptualizing psychopathology: A special section of the Journal of Abnormal Psychology. *Journal of Abnormal Psychology*, *125*, 1023. doi:10.1037/abn0000223
- Kwapil, T. R., Barrantes-Vidal, N., & Silvia, P. J. (2008). The dimensional structure of the Wisconsin schizotypy scales: Factor identification and construct validity. *Schizophrenia Bulletin*, *34*, 444–457. doi:10.1093/schbul/sbm098
- Lee, T. T. C., Sellbom, M., & Hopwood, C. J. (2017). Contemporary psychopathology assessment: Mapping major personality inventories onto empirical models of psychopathology. In S. C. Bowden (Ed.), *Neuropsychological assessment in the age of evidence-based practice: Diagnostic and treatment evaluations* (pp. 64–94). New York, NY: Oxford University Press.
- Levitt, E. E., & Gotts, E. E. (1995). *The clinical application of MMPI special scales*. London, UK: Psychology Press.
- Liggett, J., Carmichael, K. L. C., Smith, A., & Sellbom, M. (2017). Validation of self-report impairment measures for Section III obsessive-compulsive and avoidant personality disorders. *Journal of Personality Assessment*, *99*, 1–14. doi:10.1080/00223891.2016.1185613
- Liggett, J., Sellbom, M., & Carmichael, K. L. C. (2017). Examining the DSM-5 Section III criteria for obsessive-compulsive personality disorder in a community sample. *Journal of Personality Disorders*, *31*, 790–809.
- Livesley, W. J. (1987). A systematic approach to the delineation of personality disorders. *American Journal of Psychiatry*, *144*, 772–777. doi:10.1176/ajp.144.6.772
- Loevinger, J. (1954). The attenuation paradox in test theory. *Psychological Bulletin*, *51*, 493–504.
- Loevinger, J. (1957). Objective tests as instruments of psychological theory. *Psychological Reports*, *3*, 635–694. doi:10.2466/pr0.1957.3.3.635
- Lynam, D. R., & Widiger, T. A. (2001). Using the five-factor model to represent the DSM-IV personality disorders: An expert consensus approach. *Journal of Abnormal Psychology*, *110*, 401–412. doi:10.1037/0021-843X.110.3.401
- Markon, K. E. (2010). Modeling psychopathology structure: A symptom-level analysis of Axis I and II disorders. *Psychological Medicine*, *40*, 273–288. doi:10.1017/S0033291709990183
- Markon, K. E., Krueger, R. F., & Watson, D. (2005). Delineating the structure of normal and abnormal personality: An integrative hierarchical approach. *Journal of Personality and Social Psychology*, *88*, 139–157. doi:10.1037/0022-3514.88.1.139
- McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, *52*, 81. doi:10.1037/0022-3514.52.1.81
- Mihura, J. L., Roy, M., & Graceffo, R. A. (2017). Psychological assessment training in clinical psychology doctoral programs. *Journal of Personality Assessment*, *99*, 153–164. doi:10.1080/00223891.2016.1201978
- Millon, T. (1987). *Millon Clinical Multiaxial Inventory-II*. Minneapolis, MN: National Computer Systems
- Millon, T., & Strack, S. (2015). An integrating and comprehensive model of personality pathology based on evolutionary theory. In S. K. Huprich (Ed.), *Personality disorders: Toward theoretical and empirical integration in diagnosis and assessment* (pp. 367–393). Washington, DC: American Psychological Association.
- Morey, L. C. (1991). *Professional manual for the Personality Assessment Inventory*. Odessa, FL: Psychological Assessment Resources
- Morey, L. C., & Skodol, A. E. (2013). Convergence between DSM-IV-TR and DSM-5 diagnostic models for personality disorder: Evaluation of strategies for establishing diagnostic thresholds. *Journal of Psychiatric Practice*, *19* (3), 179–193. doi:10.1097/01.pra.0000430502.78833.06
- Morey, L. C., Waugh, M. H., & Blashfield, R. K. (1985). MMPI scales for DSM-III personality disorders: Their derivation and correlates. *Journal of Personality Assessment*, *49*, 245–251. doi:10.1207/s15327752jpa4903_5
- Mullins-Sweatt, S. N., & Widiger, T. A. (2009). Clinical utility and DSM-V. *Psychological Assessment*, *21*, 302. doi:10.1037/a0016607
- Nunnally, J. (1962). The analysis of profile data. *Psychological Bulletin*, *59*, 311–319. doi:10.1037/h0041246
- Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological Methodology*, *25*, 111–163. doi:10.2307/271063
- Ready, R. E., & Veague, H. B. (2014). Training in psychological assessment: Current practices of clinical psychology programs. *Professional Psychology: Research and Practice*, *45*, 278. doi:10.1037/a0037439
- Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 375–398). New York, NY: Guilford.
- Samuel, D. B., Hopwood, C. J., Krueger, R. F., Thomas, K. M., & Ruggero, C. J. (2013). Comparing methods for scoring personality disorder types using maladaptive traits in DSM-5. *Assessment*, *20*, 353–361. doi:10.1177/1073191113486182

- Samuel, D. B., Lynam, D. R., Widiger, T. A., & Ball, S. A. (2012). An expert consensus approach to relating the proposed DSM-5 types and traits. *Personality Disorders: Theory, Research, and Treatment*, 3, 1–16. doi:10.1037/a0023787
- Samuel, D. B., & Widiger, T. A. (2004). Clinicians' personality descriptions of prototypic personality disorders. *Journal of Personality Disorders*, 18, 286–308. doi:10.1521/pedi.18.3.286.35446
- Samuel, D. B., & Widiger, T. A. (2008). A meta-analytic review of the relationships between the five-factor model and DSM-IV-TR personality disorders: A facet level analysis. *Clinical Psychology Review*, 28, 1326–1342. doi:10.1016/j.cpr.2008.07.002
- Samuel, D. B., & Widiger, T. A. (2010). A comparison of obsessive-compulsive personality disorder scales. *Journal of Personality Assessment*, 92, 232–240. doi:10.1080/00223891003670182
- Saulsman, L. M., & Page, A. C. (2004). The five-factor model and personality disorder empirical literature: A meta-analytic review. *Clinical Psychology Review*, 23, 1055–1085. doi:10.1016/j.cpr.2002.09.001
- Schuler, C. E., Snibbe, J. R., & Buckwalter, J. G. (1994). Validity of the MMPI personality disorder scales (MMPI-PD). *Journal of Clinical Psychology*, 50, 220–227. doi:10.1002/1097-4679(199403)50:2<220::AID-JCLP2270500211>3.0.CO;2-J
- Sellbom, M. (2016). Elucidating the validity of the externalizing spectrum of psychopathology in correctional, forensic, and community samples. *Journal of Abnormal Psychology*, 125, 1027–1038. doi:10.1037/abn0000171
- Sellbom, M., Bach, B., & Huxley, E. (2018). Related personality disorders located within an elaborated externalizing psychopathology spectrum. In J. Lochman & W. Matthys (Eds.), *The Wiley handbook of disruptive and impulse-control disorders* (pp. 103–124). Hoboken, NJ: Wiley.
- Sellbom, M., Ben-Porath, Y. S., Patrick, C. J., Wygant, D. B., Gartland, D. M., & Stafford, K. P. (2012). Development and construct validation of MMPI-2-RF measures assessing global psychopathy, fearless-dominance, and impulsive-antisociality. *Personality Disorders: Theory, Research, and Treatment*, 3, 17–38. doi:10.1037/a0023888
- Sellbom, M., Sansone, R. A., Songer, D. A., & Anderson, J. L. (2014). Convergence between DSM-5 Section II and Section III diagnostic criteria for borderline personality disorder. *Australian and New Zealand Journal of Psychiatry*, 48, 325–332. doi:10.1177/0004867413511997
- Sellbom, M., Smid, W., De Saeger, H., Smit, N., & Kamphuis, J. H. (2014). Mapping the Personality Psychopathology Five domains onto DSM-IV personality disorders in Dutch clinical and forensic samples: Implications for the DSM-5. *Journal of Personality Assessment*, 96, 185–192. doi:10.1080/00223891.2013.825625
- Sellbom, M., & Smith, A. (2017). Assessment of DSM-5 Section II personality disorders with the MMPI-2-RF in a nonclinical sample. *Journal of Personality Assessment*, 99, 384–397. doi:10.1080/00223891.2016.1242074
- Sharp, C., Wright, A. G., Fowler, J. C., Frueh, B. C., Allen, J. G., Oldham, J., & Clark, L. A. (2015). The structure of personality pathology: Both general ('g') and specific ('s') factors? *Journal of Abnormal Psychology*, 124, 387. doi:10.1037/abn0000033
- Simms, L. J., Goldberg, L. R., Roberts, J. E., Watson, D., Welte, J., & Rotterman, J. H. (2011). Computerized adaptive assessment of personality disorder: Introducing the CAT-PD project. *Journal of Personality Assessment*, 93, 380–389. doi:10.1080/00223891.2011.577475
- Smith, G. T., McCarthy, D. M., & Zapolski, T. C. (2009). On the value of homogeneous constructs for construct validation, theory testing, and the description of psychopathology. *Psychological Assessment*, 21, 272. doi:10.1037/a0016699
- Somwaru, D. P., & Ben-Porath, Y. S. (1995, March). *Development and reliability of MMPI-2 based personality disorder scales*. Paper presented at the 30th Annual Workshop and Symposium on Recent Developments in Use of the MMPI-2 and MMPI-A, St. Petersburg Beach, FL.
- Streiner, D. L., & Miller, H. R. (1988). Validity of MMPI scales for DSM-III personality disorders: What are they measuring? *Journal of Personality Disorders*, 2, 238–242. doi:10.1521/pedi.1988.2.3.238
- Tellegen, A., & Ben-Porath, Y. S. (2008). *MMPI-2-RF: Technical manual*. Minneapolis, MN: University of Minnesota Press.
- Tellegen, A., Ben-Porath, Y. S., McNulty, J. L., Arbisi, P. A., Graham, J. R., & Kaemmer, B. (2003). *MMPI-2 Restructured Clinical (RC) scales: Development, validation, and interpretation*. Minneapolis, MN: University of Minnesota Press.
- Tyrer, P. (2009). Why borderline personality disorder is neither borderline nor a personality disorder. *Personality and Mental Health*, 3(2), 86–95. doi:10.1002/pmh.78
- Verheul, R. (2005). Clinical utility of dimensional models for personality pathology. *Journal of Personality Disorders*, 19, 283–302. doi:10.1521/pedi.2005.19.3.283
- Widiger, T. A., Costa, P. T., & McCrae, R. R. (2002). A proposal for Axis II: Diagnosing personality disorders using the Five-Factor Model. In P. T. Costa & T. A. Widiger (Eds.), *Personality disorders and the five-factor model of personality* (pp. 431–456). Washington, DC: American Psychological Association.
- Wiggins, J. S. (2003). *Paradigms of personality assessment*. New York, NY: Guilford.
- Wise, E. A. (1996). Comparative validity of MMPI-2 and MCMI-II personality disorder classifications. *Journal of Personality Assessment*, 66, 569–582. doi:10.1207/s15327752jpa6603_7
- Wright, A. G. C. (2011). Qualitative and quantitative distinctions in personality disorder. *Journal of Personality Assessment*, 93, 370–379. doi:10.1080/00223891.2011.577477
- Wright, A. G., Krueger, R. F., Hobbs, M. J., Markon, K. E., Eaton, N. R., & Slade, T. (2013). The structure of psychopathology: Toward an expanded quantitative empirical model. *Journal of Abnormal Psychology*, 122, 281. doi:10.1037/a0030133
- Yam, W. H., & Simms, L. J. (2014). Comparing criterion- and trait-based personality disorder diagnoses in DSM-5. *Journal of Abnormal Psychology*, 123, 802–808. doi:10.1037/a0037633
- Zachar, P. (2008). Real kinds but no true taxonomy. In K. S. Kendler & J. Parnas (Eds.), *Philosophical issues in psychiatry* (pp. 327–354). Baltimore, MD: Johns Hopkins University Press.
- Zachar, P., & Kendler, K. S. (2007). Psychiatric disorders: A conceptual taxonomy. *American Journal of Psychiatry*, 164, 557–565. doi:10.1176/ajp.2007.164.4.557
- Zachar, P., & Kendler, K. S. (2017). The philosophy of nosology. *Annual Review of Psychology*, 13, 49–71. doi:10.1146/annurev-clinpsy-032816-045020
- Zanarini, M. C., & Frankenburg, F. R. (2007). The essential nature of borderline psychopathology. *Journal of Personality Disorders*, 21, 518–535. doi:10.1521/pedi.2007.21.5.518

Appendix. MMPI-2-RF personality disorder spectra scale scoring

Personality disorder	MMPI-2-RF items
Paranoid	<i>True:</i> 10 55 63 71 92 99 110 143 150 185 194 213 233 235 260 264 310 327 332 <i>False:</i> 134 212
Schizoid	<i>True:</i> 67 124 175 291 326 <i>False:</i> 4 8 11 47 53 57 109 153 201 323
Schizotypal	<i>True:</i> 12 14 32 34 46 51 121 129 136 137 139 168 176 179 199 203 216 240 242 252 257 270 273 280 287 294 311 <i>False:</i> 85
Antisocial	<i>True:</i> 5 21 26 41 45 66 84 96 115 141 156 178 193 205 218 223 231 253 255 292 305 312 329 <i>False:</i> 61 190
Borderline	<i>True:</i> 16 22 23 29 62 81 89 93 103 106 117 130 138 155 164 204 215 228 248 250 251 261 307 314 318 334 337 <i>False:</i> 19 38 80 83 105 217 237 293
Histrionic	<i>True:</i> 17 47 57 107 118 131 153 195 196 201 295 <i>False:</i> 44 67 114 249 268
Narcissistic	<i>True:</i> 39 64 97 104 116 119 142 147 182 197 236 239 244 246 256 302 <i>False:</i> 48 89 288
Avoidant	<i>True:</i> 35 44 48 91 114 132 177 249 278 322 <i>False:</i> 17 37 94 182 222 295
Dependent	<i>True:</i> 24 27 56 108 112 135 152 198 206 229 232 269 288 299 319 335 <i>False:</i> 60 102 104 197 246
Obsessive-compulsive	<i>True:</i> 13 68 149 187 191 224 243 271 274 303 309 <i>False:</i> 160

Note. Minnesota Multiphasic Personality Inventory-2 Restructured Form (MMPI-2-RF) Personality Disorder Spectra scales © 2017 by Martin Sellbom. All rights reserved.