ORIGINAL ARTICLE

Incremental validity of the PID-5 in relation to the five factor model and traditional polythetic personality criteria of the DSM-5

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Abstract

Background This study assessed the incremental validity of the Personality Inventory for DSM-5 (PID-5) beyond the impact of demographic, burden of illness, five-factor model of personality, and DSM-5 personality disorder criteria with respect to associations with admission psychiatric symptoms and functional disability.

Methods Psychiatric inpatients ($N = 927$) were administered the Big Five Inventory, PID-5, and personality disorder criteria counts. Prior treatment utilization, as well as baseline depression, anxiety, emotion regulation, and functional disability were administered within two days of the personality measures. Hierarchical regression models were used to explore the association of personality functioning with symptom functioning, emotion regulation and disability.

Results Neuroticism was associated with all symptom measures, providing further support for its relevance in clinical populations. Personality trait domains (negative affect, detachment, and psychoticism) from the PID-5 demonstrated incremental validity in predicting baseline symptom and disability functioning over and above demographic, burden of illness, and psychiatric comorbidity and five-factor model (FFM) personality traits.

Conclusions Dimensional measures of personality functioning were consistently associated with baseline symptom functioning, supporting the relevance of personality functioning as it relates to psychiatric symptoms. The PID-5 uniquely contributed to the prediction of baseline symptom functioning, thus providing incremental validity over gold-standard personality trait measures.

KEYWORDS

incremental validity, methodology, personality traits, psychometrics, scale validation

1 | INTRODUCTION

Maladaptive personality traits such as neuroticism predict the onset of clinical syndromes such as depression (Clark, Watson, & Mineka, 1994; Ormel, Oldehinkel, & Vollebergh, 2004; Kendler, Kuhn, & Prescott, 2004; Kendler, Neale, Kessler, Heath, & Eaves, 1993; Kendler, Gatz, Gardner, & Pedersen, 2006) and increase the risk of poor treatment outcome in a five-year prospective study (Bukh, Andersen, & Kessing, 2016). A variety of well-established dimensional models of personality traits including the five-factor model (FFM) demonstrate predictive validity in the relation to clinical personality features (Markon &

Krueger, 2006; Hopwood & Zanarini, 2010; Spitzer, First, Shedler, Westen, & Skodol, 2008; Morey et al., 2007, 2012; Samuel & Widiger, 2006, 2008; Skodol et al., 2005; Widiger & Samuel, 2005; Kotov, Gamez, Schmidt, & Watson, 2010), clinical syndromes such as anxiety and substance abuse (Ozer & Benet-Martinez, 2006), well-being, interpersonal and occupational functioning in prospective longitudinal studies (Morey et al., 2012; Widiger & Samuel, 2005; Kotov et al., 2010), as well as a variety of health, morbidity, and physical disease outcomes (Deary, Weiss, & Batty, 2010). In light of empirical evidence supporting dimensional models of personality and the performance of the FFM, the *Diagnostic and Statistical Manual of Mental Disorders* (DSM)

Personality and Personality Disorders Work Group (hereafter Work Group) proposed a hybrid, dimensional model for diagnosing personality disorders consisting of five broad, higher-order personality trait domains comprised of subordinate trait facets of personality functioning (Skodol et al., 2011; Skodol, 2012). This new model was considered an extension of the FFM, but was designed to be significantly simpler, and unipolar (focusing on maladaptive personality traits) rather than bipolar assessment of personality traits (Trull & Widiger, 2013). The Personality Inventory for DSM-5 (PID-5) was developed by the Work Group as a freely available self-report instrument to assess the above personality traits facets and five trait domains (Krueger, Derringer, Markon, Watson, & Skodol, 2012). The PID-5 has demonstrated adequate factor structure, construct and predictive validity; however, its incremental validity in relation to the predominant FFM and traditional personality disorder diagnostic criteria has not been assessed. The current study assessed the incremental validity of the PID-5 trait domains beyond the impact of demographic, burden of illness, FFM, and personality disorders criteria from the Structured Clinical Interview for DSM-IV in predicting psychiatric symptoms in a large psychiatric inpatient sample.

In 2013 the American Psychiatric Association (APA) Board of Trustees approved the final diagnostic criteria for the fifth edition of the DSM (2013) that included a decision to include the hybrid model for diagnosing personality disorders and several emerging measures including the PID-5 (labeled the Alternative Model and located in Section 3 "Emerging Measures and Models" of the manual). Initial development of the PID-5 used item-response theory models to derive 25 discrete trait facets that loaded onto five broad personality trait domains of negative affectivity, detachment, antagonism, disinhibition, and psychoticism). Per the DSM-5 hybrid model, negative affectivity approximates FFM neuroticism, detachment approximates FFM introversion, antagonism approximates low FFM agreeableness, disinhibition approximates low FFM conscientiousness, and psychoticism approximates FFM openness (Costa & McCrae, 1995; Trull, 2012).

Evidence from non-clinical samples indicated the PID-5 latent trait domain structures were concordant with FFM traits (Thomas et al., 2013) and demonstrated good convergence with well-established personality trait measures (Anderson et al., 2013; Ashton, Lee, de Vries, Hendrickse, & Born, 2012; Fossati, Krueger, Markon, Borroni, & Maffei, 2013; Wright et al., 2012). Psychiatric outpatient data from the DSM-5 field trials (Quilty, Ayeast, Chmielewski, Pollock, & Bagby, 2013) supported the convergence between PID-5 and all but one of the FFM domains (openness) as well as demonstrated adequate discriminant validity. Assessments of the clinical utility of the PID-5 indicated that trait domains accounted for a substantial amount of variance in DSM-IV personality disorder severity and are linked to DSM-IV personality disorders (Few et al., 2013), and demonstrated incremental validity in predicting DSM-IV personality disorders (Hopwood, Thomas, Markon, Wright, & Krueger, 2012). Recent findings indicated that PID-5 traits are highly stable, prospectively predictive of psychosocial functioning, and associated with psychosocial functioning over time (Wright et al., 2015).

Taken together, prior evidence provide support for the PID-5 as a measure of the dimensional personality facets and traits; however, little is known about the added value of the PID-5 in relation to established

dimensional measures of personality assessment including the FFM. With the publication of DSM-5, a host of questions emerge in relation to validity of the PID-5 and the Alternative Model, not the least of which is its relative incremental validity in predicting symptom severity and functional impairment when compared to well-established FFM and the DSM-5 traditional approach to personality assessment.

In light of the concordance between FFM and PID-5 domains (Thomas et al., 2013), we hypothesized medium-to-large effect size correlations ($r = 0.30-0.75$) between negative affectivity and neuroticism, detachment and introversion (negative correlation with extroversion), antagonism and agreeableness (negative correlation), disinhibition and conscientiousness (negative correlation), and psychoticism and openness. Associations with depression severity were hypothesized to include FFM neuroticism (Clark et al., 1994; Ormel et al., 2004; Kendler et al., 1993, 2004; Bukh et al., 2016; Kotov et al., 2010). Because the PID-5 was constructed to assess maladaptive personality features, we hypothesized that the PID-5 negative affectivity would demonstrate unique association above and beyond FFM neuroticism. Associations with anxiety severity were hypothesized to include FFM neuroticism (Kotov et al., 2010), and PID-5 negative affectivity was expected to provide unique prediction above and beyond neuroticism. Given the link between neuroticism and emotion dysregulation (Larsen & Ketelaar, 1991). Associations with emotion dysregulation were hypothesized to include FFM neuroticism, and PID-5 negative affectivity was expected to provide unique prediction above and beyond neuroticism. Overall functional disability was hypothesized to be associated with FFM neuroticism (Ro & Clark, 2013; Verboom et al., 2011) and negatively associated with conscientiousness (Ro & Clark, 2013; Verboom et al., 2011). Based on the work of Wright et al. (2012) PID-5 negative affect, detachment and disinhibition were hypothesized to demonstrate prediction beyond the FFM factors. We made no specific hypotheses regarding personality functioning and somatization given the non-significant results from a recent large-scale study of somatic complaints and FFM personality traits (McBeth et al., 2015).

2 | METHODS

2.1 | Participants

The sample consisted of 927 consecutively admitted inpatient adults (52% females). Patients were included in the study regardless of symptom severity or co-morbid diagnoses. Marital status was single (56.2%), married (26.9%), divorced/separated (13.4%), widowed (0.9%), common-law marriage (1.6%), and did not respond (1.0%). The majority were Caucasian (90.5%), with small percentages identifying as multiracial (5.4%), Asian (1.7%), Black/African American (1.6%), and American Indian (0.4%). Average age at admission was 35.26 years (standard deviation [SD] = 14.70).

2.2 | Treatment setting and procedures

Consecutively admitted patients (November 2013–March 2016) were invited to participate. There were no exclusion criteria. Data were collected as part of the hospital's Adult Outcomes Project, described in

detail elsewhere (Fowler, 2015). All participants were assessed using validated measures at admission and were reassessed periodically over the course of treatment. Assessments were conducted via a hospital-wide web survey on laptop computers. This project was a hybrid research-quality improvement project, conducted with all patients. Use of the project's data was approved by Baylor College of Medicine's Institutional Review Board (IRB). Baseline measures were collected within 72 hours of admission.

2.3 | Measures

Demographic variables and history of psychiatric service usage were assessed using a standardized patient information survey. A modified 14-item version of the Stressful Life Events Screening Questionnaire (SLESQ-R) assesses trauma-related events including sexual assault, attempted sexual assault, molestation, child physical abuse, and other physical assault (Elhai et al., 2012). A large-scale psychometric study of the SLESQ-R (Allen, Madan, & Fowler, 2015) found a high level of internal consistency (Ordinal alpha = 0.87). Personality disorder diagnoses were assessed using the research version of the Structured Clinical Interview for DSM-IV Axis I Personality Disorders (SCID-I: First et al., 1997). Individual-level criteria were coded as absent (0) or present (1) for Antisocial, Avoidant, Borderline, Narcissistic, Obsessive-Compulsive, and Schizotypal with no skip-outs (other personality disorders were not coded due to base-rates below 1% in the hospital between 2010 and 2012). Psychiatric disorders were assessed using the research versions of the Structured Clinical Interview for DSM-IV Disorders (SCID-I: First et al., 2002). Master's level researchers conducted all interviews and coded diagnoses after reviewing past psychiatric history, collateral information from family, psychosocial assessment, nursing staff assessment. This process combined the ecologically valid longitudinal evaluation of the "all available data" diagnostic approach (Pilkonis et al., 1995) with the rigorous research diagnostic interviews. For this study, total criteria count for each personality disorder was used as an analog dimensional measure of personality pathology.

The Personality Inventory for DSM-5 (Kreuger et al., 2012) is a 220-item dimensional measure comprised of 25 non-overlapping scales that load onto five higher-order dimensions (negative affect, detachment, antagonism, disinhibition, and psychoticism). As noted in the introduction, the PID-5 exhibited good psychometric properties in non-clinical and outpatient samples. The PID-5 yielded strong internal consistency in the current sample (Cronbach's $\alpha = 0.98$). The Big Five Inventory (BFI) is a 44-item questionnaire that assesses the FFM personality domains of neuroticism, agreeableness, conscientiousness, extraversion and openness (John & Srivastava, 1999). Domain scales demonstrate high reliability, clear factor structure, and strong convergence with the NEO Five Factor Inventory (NEO-FFI). The BFI yielded good internal consistency in the current sample (Cronbach's $\alpha = 0.81$). Patient Health Questionnaire – Depression (PHQ-9) is a 9-item screen for depression severity with excellent internal consistency, construct validity, and test-retest reliability (Kroenke & Spitzer, 2002). In the current sample internal consistency of the PHQ-9 was good (Cronbach's $\alpha = 0.90$). The PHQ Generalized Anxiety Disorder (GAD-7) scale consists of seven items assessing anxiety severity (Spitzer,

Kroenke, Williams, & Lowe, 2006), demonstrates excellent internal consistency, construct validity, and test-retest reliability (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007). The GAD-7 scale yielded excellent internal consistency (Cronbach's $\alpha = 0.91$) in the current sample. The PHQ-15 assesses 15 somatic symptoms, exhibits solid psychometric properties (Kroenke, Spitzer, & Williams, 2002), and yielded good internal consistency (Cronbach's $\alpha = 0.81$) in the current sample. The Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-report measure assessing difficulties in emotion-regulation (Gratz & Roemer, 2004). Items are rated on a 5-point scale with ordinal response options, ranging from 1 (almost never, 0–10%) to 5 (almost always, 91–100%). The scale yields a total score (range 36–180) with higher scores indicative of greater degree of impairment in emotion-regulation. The DERS has demonstrated excellent two-month test-retest reliability ($r = 0.88$), stable factor structure (Fowler et al., 2014) and in the current sample internal consistency of the DERS was excellent (Cronbach's $\alpha = 0.95$). The 12-item World Health Organization's Disability Assessment Schedule 2.0 (WHODAS-II) is broadband measure of functional impairment associated with illness (World Health Organization [WHO], n.d.). The measure assesses six domains of functioning that correspond to the following International Classification of Functioning, Disability and Health (ICF) codes: cognition, mobility, self-care, getting along, life activities and participation. The measure possesses excellent psychometric properties and is widely used in clinical and research settings (Chwastiak & Von Korff, 2003; Hudson et al., 2008; Luciano et al., 2010). Internal consistency of the WHODAS-II was good (Cronbach's $\alpha = 0.89$) in the current sample.

2.4 | Data analysis

Data analyses were carried out utilizing SPSS for windows, version 22.0 (IBM software). Data analysis proceeded in five steps: (1) descriptive statistics were computed for demographic, diagnostic, past service utilization data, BFI, SCID-II personality disorder criteria totals and PID-5 trait domains; (2) internal consistency of the PID-5 trait facets and domains were calculated using coefficient alpha; (3) Pearson product of moment correlations were computed for FFM and PID-5 traits; (4) correlation analyses to explore potential confounds such as gender, age, and history of trauma with depression, anxiety, emotion regulation difficulties and functional disability; (5) hierarchical stepwise regression analyses utilizing demographic, burden of illness, and personality dimensions to predict depression, anxiety, emotion regulation difficulties and functional disability. Independent variables were entered in separate steps in the following sequence: Step 1: demographic variables (age, gender, trauma); Step 2: burden of illness defined as past hospitalizations, past outpatient treatment trials, total number of psychiatric disorders (excluding personality disorders); Step 3: BFI dimensions (openness, conscientiousness, extraversion, agreeableness, neuroticism); Step 4: SCID-II total criteria count for PDs (avoidant, obsessive-compulsive; Step 5: PID-5 trait domains (negative affect, detachment, antagonism, disinhibition, psychoticism). Due to the large number of independent variables in each model, Bonferroni adjustment (Perrett, Schaffer, Piccone, & Roozeboom, 2006) was set at ($p < 0.001$) to reduce type 1 error. Trimmed models excluding non-significant variables were reported.

3 | RESULTS

Past psychiatric histories and diagnostic profiles were indicative of high levels of service utilization, functional impairment and co-morbidity consistent with current definitions of serious mental illness (Kessler et al., 2010). Patients admitted with a high number of previous outpatient therapists (mean [M] = 4.0, SD = 3.2) prior psychopharmacologists (M = 3.0, SD = 2.3), psychiatric hospitalizations (M = 2.4, SD = 4.1), and high rates of lifetime (65.6%) and past two months (49.2%) suicidal ideation. Eighty-two percent of patients were diagnosed with at least two co-occurring Axis I/II disorders (M = 3.2; SD = 1.9). Major mood disorders were present in 85.4% of patients (major depressive disorder spectrum = 66.7%; bipolar spectrum = 17.7%), 62.4% with anxiety spectrum disorders, and 57.3% with a substance use disorder. The majority (65.8%) were unable to work in the 30 days prior to admission.

Descriptive statistics for demographic, burden of illness and personality measures (Table 1) indicated relatively normal distribution characteristics for all but four variables. Square root transformations were computed for outpatient treatment trials, prior hospitalizations and SCID-II total criteria for schizotypal and antisocial personality disorder, due to abnormal distributions. Transformed values were normally distributed; therefore, transformed variables were utilized in all analyses.

TABLE 1 Descriptive statistics of dimensional personality factors (N = 927)

	<i>M</i> (<i>SD</i>)	<i>Skew</i>	<i>Kurtosis</i>
<i>Burden of illness</i>			
Age	35.39 (14.73)	.713	-.642
Trauma	6.33 (4.54)	-.066	-.963
Outpatient trials	7.03 (4.93)	2.301	8.98
Hospitalizations	2.32 (4.09)	8.74	144.02
Axis I disorders	2.73 (1.46)	.474	.075
Personality disorders	0.53 (.86)	1.90	5.18
<i>PID-5</i>			
Negative affect	1.43 (.66)	.033	-.744
Detachment	1.12 (.62)	.335	-.501
Antagonism	0.99 (.56)	.618	.219
Disinhibition	1.07 (.62)	.316	-.597
Psychoticism	0.70 (.56)	1.12	1.30
<i>BFI</i>			
Openness	48.77 (9.91)	-.607	.161
Conscientiousness	45.54 (12.54)	-.155	-.544
Extroversion	46.12 (12.56)	.181	-.716
Agreeableness	50.42 (11.94)	-.665	.435
Neuroticism	60.10 (10.09)	-.881	.646
<i>SCID-II total criteria</i>			
Avoidant personality disorder	1.68 (1.86)	.971	.018
Obsessive-compulsive personality disorder	1.57 (1.57)	.994	.684
Schizotypal personality disorder	0.39 (.80)	3.29	16.05
Narcissistic personality disorder	0.73 (1.16)	2.43	8.77
Borderline personality disorder	2.35 (2.22)	.840	-.125
Antisocial personality disorder	0.12 (.65)	6.28	42.30

Internal consistency of the PID-5 trait facets and domains (Table 2) demonstrated acceptable levels of alpha of all higher-order trait domains, and the majority of trait facets (Nunnally & Bernstein, 1994). Marginally acceptable alphas were observed for grandiosity, irresponsibility, and suspiciousness.

Correlations between FFM and PID-5 traits (Table 3) indicated that neuroticism and negative affectivity as well as extraversion and detachment produced large effect size correlations while agreeableness and antagonism produced a medium effect. PID-5 disinhibition and psychoticism demonstrated small effect size correlations.

Correlations between dimensional measures of personality and burden of illness measures (Table 4) revealed small effect size correlations between total number of prior treatment trials and PID-5 negative affect, detachment, FFM neuroticism and total borderline personality disorder (BPD) criteria. Number of past hospitalizations evidenced small effect size associations with PID-5 psychoticism and total BPD criteria. Total number of Axis I disorders was positively correlated with all PID-5 trait domains, FFM neuroticism, negative association with

TABLE 2 Descriptives of PID-5 trait domain total scores and facet scores

	<i>M</i> (<i>SD</i>)	<i>Range</i>	<i>Cronbach α</i>
<i>Trait domains</i>			
Negative affect	2.02 (0.61)	0–3	.93
Detachment	1.42 (0.63)	0–3	.94
Antagonism	0.93 (0.76)	0–3	.91
Disinhibition	0.92 (0.75)	0–3	.92
Psychoticism	1.11 (0.71)	0–3	.95
<i>Trait facets</i>			
Anhedonia	1.30 (.92)	0–3	.92
Anxiousness	1.71 (.88)	0–3	.91
Attention seeking	.92 (.82)	0–3	.90
Callousness	.24 (.48)	0–3	.84
Deceitfulness	.61 (.71)	0–3	.89
Depressivity	1.32 (.90)	0–3	.94
Distractibility	1.52 (.91)	0–3	.92
Eccentricity	1.00 (.88)	0–3	.95
Emotional lability	1.35 (.89)	0–3	.89
Grandiosity	.47 (.66)	0–3	.78
Hostility	.95 (.76)	0–3	.88
Impulsivity	1.05 (.89)	0–3	.82
Intimacy avoidance	.65 (.79)	0–3	.82
Irresponsibility	.74 (.70)	0–3	.80
Manipulativeness	.84 (.79)	0–3	.83
Perceptual dysregulation	.62 (.65)	0–3	.84
Perseveration	1.24 (.79)	0–3	.86
Restricted affectivity	.97 (.76)	0–3	.81
Rigid perfectionism	1.06 (.84)	0–3	.91
Risk taking	1.32 (.74)	0–3	.92
Separation insecurity	1.20 (.84)	0–3	.85
Submissiveness	1.58 (.85)	0–3	.82
Suspiciousness	1.02 (.71)	0–3	.80
Unusual beliefs	.46 (.67)	0–3	.82
Withdrawal	1.15 (.83)	0–3	.92

TABLE 3 Correlations between PID-5 trait domains and FFM factors (N = 927)

	Neuroticism	Extraversion	Agreeableness	Conscientiousness	Openness
Negative affect	.56	-.18	-.20	-.23	-.08
Detachment	.40	-.52	-.31	-.26	-.19
Antagonism	.07	.05	-.38	-.12	.10
Disinhibition	.02	.05	-.37	-.12	.10
Psychoticism	.17	-.11	-.23	-.26	.18

TABLE 4 Demographic burden of illness factors and personality dimensions (N = 927)

	Age	Gender	Treatment trials	Past hospitalizations	Total Axis I	Total Axis II
<i>PID-5</i>						
Negative affect	-.190**	-.179**	.178**	.065	.279**	.373**
Detachment	-.138**	.025	.132**	.063	.194**	.321**
Antagonism	-.272**	.125**	.025	-.010	.250**	.355**
Disinhibition	-.307**	-.017	.089	.009	.300**	.371**
Psychoticism	-.305**	.069	.052	.102**	.216**	.335**
<i>BFI</i>						
Openness	-.049	.063	.028	-.017	.053	.003
Conscientiousness	-.275**	-.008	.088	.050	-.201**	-.214**
Extraversion	-.154*	-.59	-.033	-.031	-.091	-.201**
Agreeableness	-.191**	-.119**	-.035	.029	-.154**	-.282**
Neuroticism	-.078	-.178**	.177**	-.053	.250**	.283**
<i>SCID-II criteria</i>						
AVPD total	-.260**	-.028	.048	.050	.349**	.662**
OCPD total	-.068	-.026	.035	.009	.266**	.583**
STPD total	-.155**	.006	.072	.074	.221**	.431**
NPD total	-.190**	.111**	.002	.009	.231**	.419**
BPD total	-.285**	-.100*	.120**	.103**	.471**	.641*
ASPD total	-.117**	-.003	.031	.038	.189**	.307**

Note: AVPD, avoidant personality disorder; OCPD, obsessive-compulsive personality disorder; STPD, schizotypal personality disorder; NPD, narcissistic personality disorder; BPD, borderline personality disorder; ASPD, antisocial personality disorder.

*Correlation is significant at the 0.001 level (2-tailed).

**Correlation is significant at the 0.0001 level (two-tailed).

conscientiousness and agreeableness, and all DSM-5 personality disorder total criteria counts. Total number of DSM-5 personality disorders evidenced medium effect size correlations with all PID-5 trait domains but small effect size correlations with FFM traits with the exception of openness.

Hypothesized associations with depression severity were partially supported: Hierarchical regression models indicated that depression severity was associated with female gender, greater neuroticism, higher number of obsessive-compulsive personality disorder (OCPD) criteria, and elevated PID-5 detachment. This model accounted for approximately 43% of the variance in explaining depression severity. Hypothesized associations with anxiety were fully supported; however, several unanticipated predictors added to the model. A history of trauma, elevated FFM neuroticism, OCPD criteria and PID-5 negative affect were associated with anxiety severity, accounting for approximately 39% of the variance in anxiety severity at admission. Somatization severity was associated with female gender, trauma history higher number of DSM-5 clinical diagnoses, and elevated scores on FFM neuroticism and PID-5 psychoticism. This model accounted for approximately 30% of the variance in predicting somatization. Hypothesized

associations with emotion dysregulation were supported, with several unanticipated predictors. Gender (female), elevated FFM neuroticism, lower conscientiousness, and elevated PID-5 negative affect and detachment were associated with greater emotional dysregulation, accounting for approximately 55% of the variance (Table 5).

Hypothesized associations with functional disability were partially supported. Functional disability was associated with female gender, history of trauma, number of outpatient treatment trials, elevated FFM neuroticism, lower conscientiousness, and elevated PID-5 detachment. This model explained approximately 35% of the variance in admission disability severity. For all models variance inflated factor (VIF) values were below 2.0 (VIF ≥ 10 increases risk of multi-collinearity) for all variables, indicating relative lack of multi-collinearity across personality trait measures/models.

4 | DISCUSSION

The current study adds to the growing evidence base in support of the validity and clinical utility of the PID-5 as a dimensional measure

TABLE 5 Personality dimensions and burden of illness with baseline psychiatric severity ($N = 927$)

Criterion	Step	Independent	β	t	p	Partial R	Partial R^2
Depression (PHQ-9)	1	Gender	-.123	-4.87	.000	-.158	.02
	2	FFM neuroticism	.396	14.18	.000	.423	.18
	3	OCPD criteria	.092	3.56	.000	.116	.01
	4	PID-5 detachment	.326	11.85	.000	.363	.13
Anxiety (GAD-7)	1	Trauma	.132	5.10	.000	.166	.03
	2	FFM neuroticism	.441	12.91	.000	.391	.15
	3	OCPD criteria	.091	3.37	.001	.110	.01
	4	PID-5 negative affect	.219	6.79	.000	.218	.05
Somatic (PHQ-15)	1	Trauma	.225	7.94	.000	.253	.06
	1	Gender	-.215	-7.54	.000	-.301	.09
	2	DSM5 Axis I	.121	4.14	.000	.263	.07
	3	FFM neuroticism	.279	9.62	.000	.384	.15
Emotion regulation (DERS)	4	PID-5 psychoticism	.134	4.68	.000	.208	.04
	1	Gender	-.083	-3.68	.000	-.120	.01
	2	FFM neuroticism	.277	9.69	.000	.304	.09
	2	FFM conscientious	-.146	-6.11	.000	-.197	.04
Disability (WHODAS-II)	3	PID-5 negative affect	.328	11.66	.000	.358	.13
	3	PID-5 detachment	.207	8.18	.000	.260	.07
	1	Gender	-.103	-3.71	.000	-.121	.01
	1	Trauma	.122	4.47	.000	.146	.02
	2	Outpatient trials	.111	3.99	.000	.130	.02
	3	FFM neuroticism	.164	5.27	.000	.171	.03
	3	FFM conscientious	-.191	-6.56	.000	-.211	.04
	4	PID-5 detachment	.321	10.74	.000	.334	.11

Note. Trimmed Models.

of personality pathology, and further contributes to the evidence for the DSM-5 Alternative Model (Oldham, 2015). As one of the emerging measures in Section 3 of DSM-5, the PID-5 exhibited adequate concurrent validity in relation to lifetime burden of illness variables as well as cross-cutting measures of psychopathology. Importantly, PID-5 trait domains of negative affect, detachment and psychoticism demonstrated incremental validity above and beyond burden of illness, FFM traits and traditional SCID-II criteria counts. Beyond statistical significance, several PID-5 trait domains accounted for considerable variance in predicting depression, anxiety, somatization, emotion dysregulation and functional disability severity even after all other factors were included in the models. While FFM neuroticism accounted for 18% of the variance for depression severity, PID-5 detachment accounted for an additional 13% of the variance. In relation to emotion dysregulation, PID-5 trait domains accounted for 20% of the variance (negative affect =13%, detachment =7%) after gender, FFM neuroticism and conscientiousness were included in previous blocks.

Beyond demonstration of incremental validity of the PID-5, the study also highlights the substantial association of FFM neuroticism with depression and anxiety severity. Results of the hierarchical regression analyses highlight the unique explanatory power of FFM and PID-5 traits, their non-overlapping features, and point to the

relative independence of FFM neuroticism from PID-5 negative affect. The current study also added to the growing body of evidence (Quilty et al., 2013; Saulsman and Page, 2004) that indicates FFM openness and PID-5 psychoticism do not assess similar constructs. Furthermore, dimensional personality traits from FFM and PID-5 demonstrated relatively weak association (small effect size correlations) with past treatment utilization and hospitalization.

The large sample ($N = 937$) of psychiatric inpatients with a high burden of illness and personality pathology is a unique strength of this study. Nonetheless, several limitations are noteworthy. Regression analyses estimated relationships among trait domains and symptomatic expression concurrently rather than prospectively, and were based on self-report rather than performance-based or observer ratings. The selected dependent variables (other than emotion regulation) do not address impairments specific to personality pathology, though the selected symptom measures are strongly associated with personality disorders (Newton-Howes, Tyrer, & Johnson, 2006). Finally, the sample does not include outpatient or normal controls and is comprised of individuals with severe mental illness with relatively high levels of personality disorder traits. While studying a sample of patients with this level of psychopathology is advantageous from the perspective of examining trait domains within a high-risk population, the generalization of results to outpatient populations may be limited.

The findings of this study are consistent with the theoretical conceptualization of the Alternative Model for assessing personality trait domains and add to the growing evidence base supporting the PID-5 as a useful research tool for assessing degree of personality pathology. Importantly, these results add to a small body of evidence indicating that PID-5 trait domains are associated with clinically relevant cross-cutting psychiatric symptomatology, such as depression and anxiety. This is the first study to assess the incremental validity of the PID-5. Consistent with renewed interest in the personality trait of neuroticism (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014), negative affect (a feature of neuroticism) is associated with anxiety, depression, and difficulties in emotion regulation, indicating the cross-cutting nature of this personality trait domain.

Results also add to a growing body of research indicating that combining multiple dimensional models of personality optimizes the prediction of important psychosocial outcomes (Morey & Zananini, 2000; Morey et al., 2007; Hopwood et al., 2011; Krueger & Eaton, 2010). From a clinical perspective, assessment of cross-cutting personality trait domains may help identify specific targets for intervention in order to bring about long-term positive outcomes (Skodol, 2012). Moreover, focusing on five broad domains of personality functioning may provide greater coherence in treatment planning and communicating with patients (Fowler et al., 2015; Skodol, Bender, & Oldham, 2014). In light of the current findings, dimensional measures of personality traits (and trait facets) may be well-suited as a research component of the NIMH Research Domains Criteria (RDoC) initiative to evaluate cross-cutting, dimensional facets of brain disorders (Insel, 2013; Insel & Cuthbert, 2015; Insel et al., 2010; Cuthbert & Insel, 2013).

Declaration of Interest Statement

The authors declare that they have no conflict of interest.

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