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DSM-5 section II personality disorders through the lens of PID-5 and MMPI-2-RF: a study of an iranian sample

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Abstract

The current study was designed to assess the Section II personality disorders (PDs) of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) using two common self-report personality assessment measures, the Minnesota Multiphasic Personality Inventory-2 Restructured Form (MMPI-2-RF) and Personality Inventory for DSM-5 (PID-5). The sample comprised 320 Iranian outpatients who completed the Structured Clinical Interview for DSM-5-Screening Personality Questionnaire (SCID-5-SPQ), PID-5, and MMPI-2-RF. To determine how the DSM-5 Section II PDs were associated with these two measures, we conducted Spearman correlations, a series of count regression models, and exploratory structural equation modelling (ESEM) analyses. The regression models revealed that although the DSM-5 Section II PDs associated with the hierarchical model of the MMPI-2-RF, there were also a few unexpected findings, reflecting some variations on personality psychopathology across this clinical sample. Likewise, the joint structure of SCID-5-SPQ along with PID-5 facets and MMPI-2-RF scales revealed an interpretable pattern of factor loadings that generally corresponded to anticipated theoretical models. The authors discuss the implications of these findings.

Keywords Personality disorders · DSM-5 Section II · PID-5 · MMPI-2-RF · HiTOP

Personality disorders (PDs) are common mental disorders with an approximate prevalence of 6% in the community population (Samuels, 2011) and up to 45% (Zimmerman et al., 2005) in psychiatric outpatients, respectively. This group of mental disorders is characterized by long-lasting, pervasive, and inflexible dysfunctional patterns of cognition, affect, interpersonal functioning, and impulse control, which clearly deviate from cultural expectations and as a consequence lead to increased personal distress (American Psychiatric Association, 2013). According to many studies, a diagnosis of PD is a high risk factor for the emerging of other mental disorders (Hallquist & Lenzenweger, 2013). Therefore, precise and early measurement of PDs and their associated characteristics could lead to the timely treatment and prevention of PDs, and most likely could improve long-term mental health outcomes (Payer et al., 2015).

Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; (American Psychiatric Association, 2013) Section II PDs represent categorical conceptualizations of the diagnosis of ten PDs. In response to several shortcomings of the categorical classification system such as arbitrary diagnostic thresholds, extensive comorbidity, considerable heterogeneity within PD categories, and weakness in coverage of personality psychopathology, an alternative approach to PD diagnosis and description was proposed by the DSM-5 Personality and Personality Disorder Workgroup. The DSM-5 Alternative model for Personality Disorders (AMPD) is described in DSM-5 Section III, which is designated for "Emerging Measures and Models."

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The AMPD includes five broad trait domains (roughly corresponding to the personality domains of the Personality Psychopathology Five [PSY-5]; (Harkness & McNulty, 1994), as well as the Five-Factor Model [FFM]; (Widiger et al., 2013) used to describe personality pathology. They are named Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism, and each of these domains subsumes multiple, more narrowly defined trait facets. Section III also contains a hybrid diagnostic system for assessing six categorical PDs (antisocial, avoidant, borderline, narcissistic, obsessive–compulsive, and schizotypal) using the dimensional AMPD traits.

It is worthwhile to emphasize that the AMPD builds upon decades of PD research and has itself been the subject of numerous peer-reviewed publications. Although the suggested maladaptive traits have been generally well-supported by empirical research, several uncertainties have also been observed, reflecting that some of the maladaptive traits vary across the population in which the research is carried out. For instance, according to a meta-analysis of 25 studies performed by Watters et al. (2018), although the suggested DSM-5 Section III maladaptive traits for each PD were mostly predictive of their corresponding DSM-5 Section II diagnosis, several unexpected findings were also encountered such as the failure of Intimacy Avoidance to predict avoidant and obsessive–compulsive PDs, of Restricted Affectivity to predict schizotypal and obsessive–compulsive PDs, and of Risk Taking to predict borderline PD. Furthermore, four PDs from the official Section II of the DSM-5 (paranoid, schizoid, histrionic, and dependent) have been excluded in this alternative diagnostic framework, which was a considerable debate of the DSM-5 (American Psychiatric Association, 2013). There was also a debate for including narcissistic PD into the alternative model (Samuel et al., 2012); the presence of only two specific pathological traits for this PD, as well as overlap with antisocial PD, would undermine the reliability and utility of narcissistic PD as an independent personality disorder (Houlcroft et al., 2012; Stanton & Zimmerman, 2019). In the light of some uncertainties, research on assessment of PDs with a dimensional perspective should be continued.

One new approach to the psychiatric diagnostic classification of mental disorders has been defined by the Hierarchical Taxonomy of Psychopathology (HiTOP) workgroup, which organizes psychopathology into a hierarchical, dimensional model arranged from signs and symptoms at the lowest level to maladaptive traits, subfactors, spectra, and finally a higher order dimension (Kotov et al., 2017). This framework is intended to provide a more empirically grounded and quantitative diagnostic system for assessing mental health conditions, including PDs (Anderson et al., 2022; Ruggero et al., 2019).

Among the existing broadband measures suggested by the HiTOP workgroup for assessing psychopathology hierarchically are the Minnesota Multiphasic Personality Inventory-2 Restructured Form (Ben-Porath & Tellegen, 2008) and Personality Inventory for DSM-5 (Krueger et al., 2012). Both measures are frequently used in research studies (Ghamkhar Fard et al., 2022; Ruggero et al., 2019) and operationalize personality psychopathology in a hierarchical form, congruent with the HiTOP framework (Kotov et al., 2017).

The PID-5 was developed by the DSM-5 Personality and Personality Disorders Workgroup to assess five broad trait domains and 25 maladaptive traits within a dimensional conceptualization (Krueger et al., 2012), consistent with the dimensional AMPD model described in DSM-5. The MMPI-2-RF's hierarchical structure centrally includes three broad domains of psychopathology, namely internalizing, thought, and externalizing dysfunctions, and it is highly consistent with dimensional models of psychopathology such as HiTOP (Sellbom et al., 2021). Similarly, the MMPI-2-RF's structure and content have been closely linked to contemporary models of personality pathology (Menton, 2016), though aligning the MMPI-2-RF with a specific model of personality or psychopathology was not a goal of the measure's development (Ben-Porath, 2012). The MMPI-2-RF operationalized a model of personality psychopathology called the PSY-5, which is extremely similar to the AMPD model at the domain level despite both models having been developed independently. More specially, the domains of Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism are closely conceptually associated with Negative Emotionality/Neuroticism (NEGE-r), Introversion/ Low Positive Emotionality (INTR-r), Aggressiveness (AGGR-r) Disconstraint (DISC-r), and Psychoticism (PSYC-r) scales, respectively. Results of a joint exploratory factor analysis study with the MMPI-2-RF PSY-5 scales and PID-5 facets, showed a five-factor model which was highly consistent with the close theoretical similarity of the PSY-5 scales and PID-5 facets (Anderson et al., 2013).

This study aimed to obtain a comprehensive assessment of DSM-5 Section II PDs using the PID-5 and MMPI-2-RF in an Iranian clinical sample, a population in which the associations between these measurement models is not well-studied. The most previous studies in this filed showed moderate convergence between the mentioned measures and Criterion B of DSM–5 alternative Model of personality disorders traits in Iranian non-clinical samples, with several divergence (Ghamkhar Fard et al., 2021a, b, 2022). However, these studies have been conducted in non-clinical contexts, the generalizability of these findings to the clinical settings is unknown. With this regard, we focused both applied and theoretical purposes.

For our applied purpose, the assessments were methodologically linked to the correlation and regression

analyses. Accordingly, we hypothesized that the AMPD traits, as operationalized in the PID-5, identified in the Section III of DSM-5 as predictive of specific PDs would be the strongest predictors of each corresponding DSM-5 Section II PD. In terms of the four DSM-5 Section II PDs which are not included in DSM-5 Section III, we considered the maladaptive personality traits proposed by Skodol et al. (2011) as hypothesized associated traits. Regarding the MMPI-2-RF, we hypothesized that the scales that emerged as predictors of PDs in a recent study of an Iranian non-clinical sample (Ghamkhar Fard et al., 2022), would be predictive of DSM-5 Section II PDs in our clinical sample, as well. The hypothesized correlations for PID-5 and MMPI-2-RF are underlined in Table 1 and 2, respectively. We assumed that conceptually related scales on both the MMPI-2-RF and PID-5 would appear as significant predictors for each PD. For instance, in terms of avoidant PD, we hypothesized that the scales with content related to social avoidance and anxiety (i.e., PID-5 Anxiousness, Anhedonia, Intimacy Avoidance, and Withdrawal facets, as well as the MMPI-2-RF EID, RC2, RC7, SFD, NFC, SAV, SHY, and NEGE-r) would capture a substantial amount of variance in predicting this PD. Additionally, we reported the mean of MMPI-2-RF T scores. Indeed, although most studies are conducted to investigate raw scores and associations between measurement tools, considering the T scores would help interpret of findings as well as present clinical decision-making.

Our theoretical aim was to determine whether the PID-5 facets and MMPI-2-RF scales could predict the DSM-5 Section II PDs according to the theoretical model presented by the HiTOP workgroup. Accordingly, we next investigated the joint structure of SCID-5-SPQ along with PID-5 facets and MMPI-2-RF scales in a factor analytic framework. This analysis would illuminate the overlapping and non-overlapping features of PDs in Iranian patients while providing a means for evaluating the extent to which the conjoint PID-5 and MMPI-2-RF measurement models conform to the HiTOP model in these data.

Our results would help researchers and clinicians in evaluating and diagnosing the PDs in an Iranian clinical sample in a dimensional perspective. Indeed, regarding the recent increasing attention to dimensional models of PDs on one hand, and the widely used of the assessment measures for determining and monitoring the treatment plans of the patients on the other hand, it is hoped our study would provide a comprehensive and detailed picture of the Iranian PDs patients in accordance with the patients' personal subjectivity, which can be applied as a guidance by Persian-speaking clinicians during assessing and treating PDs patients.

Method

Participants and procedure

Participants were adult Iranian outpatients recruited from four public mental health centers located in Tehran, which were under the Ministry of Health license for work. Participants were excluded from the study if they were diagnosed with severe or acute psychiatric or cognitive conditions (e.g., schizophrenia, bipolar disorder, active suicidality, and dementia), were younger than age 18, or were unable to read and write in Persian.

Patients evidencing potential personality pathology were referred for an initial diagnostic interview to one of four female clinicians with a doctoral degree in clinical psychology, all of whom acquired their license for giving mental health services and described their therapeutic orientation as cognitive behavioral. Their experience ranged from four years to eight. Interviewers assessed all Section II DSM-5 PD symptoms, though they were not required adhere to a standardized diagnostic interview format. Those patients who appeared to meet diagnostic criteria for any PD according to the DSM-5 Section II criteria based upon this interview received a provisional personality disorder diagnosis and were retained in the study for further assessment.

Next, to ensure resemblance with the population of interest (i.e., patients with diagnosable PDs) and obtain a standardized PD symptom count, each participant diagnosed with a PD during their initial diagnostic interview was then administered the SCID-5-SPQ; those who failed to meet diagnostic criteria for a minimum of one of the ten DSM-5 Section II PDs based on the SCID-5-SPQ (First et al., 2016), were excluded from the study. Among 557 patients who participated in the initial screening interview and received a provisional personality disorder diagnosis, 516 (93%) met the criteria for at least one PD based on SCID-5-SPQ self-report, and thus remained in the study. 37 participants with greater than 5% incomplete items on any measure were then omitted from the study due to excessive non-responsiveness. Furthermore, based on standard criteria contained in the MMPI-2-RF test manual, 159 (33.19%) participants were excluded from analysis due to one or more forms of invalid responding (Variable Response Inconsistency; VRIN-r $\geq$ 80 T [n = 21; 4.38%], True Response Inconsistency; TRIN-r $\geq$ 80 T [n = 49; 10.23%], Infrequent Responses; F-r $\geq$ 120 T [n = 47; 9.81%], or Infrequent Psychopathology Responses; Fp-r $\geq$ 100 T [n = 92; 19.21%]; see (Ben-Porath & Tellegen, 2008). We should note that while there were no meaningful differences between valid and invalid data regarding gender (X^2 (1, N = 479) = 1.365, p = 0.243; Cramer's V = 0.053) and

Table 1 Internal Consistencies, Means, and Standard Deviations of PID-5 facets, and Spearman Correlations Between DSM-5 Section II PDs and PID-5 Facets

PID-5 Facets	Internal Consistency (alpha, MIC)	M (SD)	PPD .50, .13	SPD .45, .10	STPD .40, .10	BPD .64, .17	ASPD .78, .19	NPD .58, .13	HPD .54, .17	APD .59, .17	DPD .65, .19	OCPD .47, .10
Negative Affectivity	.62, .35		**.47**	-.05	.27	**.62**	.03	.15	**.37**	.28	**.49**	.02
Anxiousness	.87, .42	1.36 (.72)	**.48**	.07	.26	**.45**	.00	.08	.16	**.37**	**.33**	.08
Depressivity	.90, .38	1.03 (.63)	**.46**	.21	.21	**.51**	-.02	-.08	.09	**.45**	**.34**	-.07
Emotional Lability	.77, .32	1.09 (.61)	**.31**	-.06	.23	**.60**	.11	.19	**.42**	.08	.23	.00
Hostility	.66, .15	1.30 (.47)	**.43**	.06	.22	**.58**	.21	**.32**	.29	.13	.18	.08
Perseveration	.75, .25	1.29 (.54)	**.36**	.20	.28	**.39**	.11	.09	.14	**.35**	**.31**	.26
Separation Insecurity	.79, .35	.94 (.67)	.22	-.18	.10	**.38**	-.04	.07	**.34**	.13	**.53**	-.09
Submissiveness	.69, .35	1.31 (.67)	.15	.10	.15	.22	.10	.08	.28	.22	**.33**	.11
Suspiciousness	.46, .11	1.43 (.44)	**.52**	.06	.21	**.31**	.16	.19	.06	.19	.11	.07
Detachment	.71, .45		**.37**	**.57**	.27	.17	.02	-.04	-.24	**.58**	.14	.03
Anhedonia	.85, .42	1.24 (.69)	**.36**	**.47**	.17	**.31**	-.02	-.09	-.10	**.49**	.28	-.02
Intimacy Avoidance	.75, .33	.79 (.64)	.21	**.40**	.16	.08	.10	-.01	-.23	**.30**	.00	.05
Restricted Affectivity	.63, .20	1.35 (.54)	.11	**.42**	.14	-.07	.08	.04	**-.30**	.22	-.10	.17
Withdrawal	.83, .32	1.38 (.60)	**.31**	**.45**	.24	.02	-.01	.01	-.26	**.55**	.02	.08
Antagonism	.75, .50		.13	-.08	.11	.18	.25	**.56**	**.36**	-.18	-.03	.05
Attention Seeking	.78, .30	1.47 (.63)	.21	-.08	.16	**.34**	.06	**.35**	**.63**	.11	.26	.04
Callousness	.76, .19	.60 (.39)	.28	.23	.14	.16	.28	.27	.09	.16	.09	.03
Deceitfulness	.76, .24	1.12 (.53)	.19	-.03	.10	.24	.25	**.41**	**.34**	-.09	.09	.04
Grandiosity	.73, .30	1.27 (.63)	.04	-.03	.12	.08	.13	**.54**	.24	-.13	-.09	.10
Manipulativeness	.74, .37	1.03 (.67)	.08	-.18	.07	.09	.24	**.44**	.28	-.26	-.13	.05
Disinhibition	.68, .41		**.37**	.13	.29	**.64**	.25	.08	**.31**	**.32**	**.42**	-.10=
Distractibility	.87, .42	1.29 (.68)	**.34**	.14	.26	**.56**	.15	.04	.21	**.40**	**.41**	-.02
Impulsivity	.77, .36	.98 (.63)	.25	.03	.23	**.51**	.23	.08	.26	.05	.23	-.15
Irresponsibility	.63, .20	.67 (.47)	.28	.07	.17	**.39**	.24	.10	.26	.22	.29	-.13
Risk Taking	.83, .25	1.23 (.54)	-.06	-.07	.00	.15	.23	.11	.10	-.27	-.11	-.04
Rigid Perfectionism	.80, .29	1.61 (.57)	.09	.12	.16	-.01	.00	.21	.08	.06	-.11	**.50**
Psychoticism	.83, .61		**.33**	.14	**.54**	**.39**	.17	.20	.22	.13	.01	.07
Eccentricity	.93, .51	.98 (.76)	**.32**	.17	**.43**	**.32**	.19	.19	.17	.19	.01	.14
Perceptual Dysregulation	.76, .21	.70 (.46)	**.32**	.14	**.53**	**.43**	.12	.16	.24	.12	.07	.03
Unusual Beliefs & Experiences	.81, .34	.81 (.64)	.17	.02	**.50**	.26	.12	.19	.18	-.07	-.08	.00

Bold correlations indicate meaningful associations; Underlined correlations represent positive hypothesized associations; Underlined correlations with a negative superscript represent negative hypothesized associations; MIC = Mean Inter-item Correlation; PPD = Paranoid Personality Disorder; SPD = Schizoid Personality Disorder; STPD = Schizotypal Personality Disorder; ASPD = Antisocial Personality Disorder; BPD = Borderline Personality Disorder; HPD = Histrionic Personality Disorder; NPD = Narcissistic Personality Disorder; APD = Avoidant Personality Disorders; DPD = Dependent Personality Disorders; OCPD = Obsessive–Compulsive Personality Disorder

Table 2 The Internal Consistencies of MMPI-2-RF scales, MMPI-2-RF T Scores, and Spearman Correlations Between DSM-5 Section II PDs and MMPI-2-RF Scales

MMPI-2-RF Scales	Internal Consistency (alpha, MIC)	Total clinical sample	PPD	SPD	STPD	BPD	ASPD	NPD	HPD	APD	DPD	OCPD
HO Scales												
EID	.90, .18	62.09 (12.76)	**.51**	.25	.23	**.53**	-.04	-.08	.07	**.56**	**.41**	-.08
THD	.74, .10	64.80 (16.05)	.29	.05	**.43**	.26	.12	.23	.24	.00	.05	.04
BXD	.69, .09	54.03 (8.99)	.16	-.01	.16	**.34**	**.45**	**.30**	**.31**	-.14	.01	-.04
RC Scales												
RCd	.90, .28	64.05 (13.56)	**.48**	.20	.28	**.57**	.02	-.02	.20	**.49**	**.44**	-.06
RC1	.74, .10	64.61 (12.59)	.26	.02	.28	**.36**	-.03	-.01	.15	.14	.28	-.09
RC2	.74, .14	59.00 (12.74)	.22	.28	.02	.15	-.13	**-.32**	-.23=	**.51**	.23	-.11
RC3	.76, .17	61.16 (9.17)	**.35**	.11	.13	**.32**	.16	.23	.11	.12	.02	.09
RC4	.72, .10	52.26 (9.70)	.29	.09	.12	**.37**	**.48**	.21	.22	.08	.09	-.06
RC6	.71, .12	**71.19 (19.74)**	**.31**	.01	.25	.26	.15	.28	.25	.00	.07	.05
RC7	.83, .17	57.57 (11.24)	**.55**	.13	**.33**	**.61**	.03	.14	.24	**.39**	**.40**	.07
RC8	.75, .14	59.66 (13.73)	.26	.08	**.53**	.29	.10	.19	.21	.04	.05	.02
RC9	.73, .09	57.37 (10.22)	.19	-.09	.24	**.43**	.27	**.43**	**.40**	-.13	.05	.09
SP Scales												
MLS	.67, .20	64.39 (12.85)	**.33**	.07	.15	**.37**	-.09	-.14	.08	**.42**	**.37**	-.18
GIC	.65, .27	60.61 (16.82)	.12	.04	.19	.21	.00	-.04	.10	.03	.16	-.07
HPC	.55, .17	55.99 (11.21)	.13	-.01	.12	.22	-.07	-.07	.10	.04	.19	-.09
NUC	.56, .11	63.52 (14.74)	.23	.01	.28	**.30**	.01	.05	.17	.11	.21	-.07
COG	.68, .17	61.67 (13.97)	**.32**	.17	.29	**.49**	.09	-.02	.16	**.35**	**.34**	-.06
SUI	.73, .35	**65.15 (24.08)**	**.31**	.15	.20	**.33**	-.01	-.02	.08	.25	.13	-.06
HLP	.57, .20	57.87 (12.98)	**.34**	.21	.09	**.36**	.01	-.10	.11	**.36**	.25	-.12
SFD	.79, .48	55.25 (12.30)	**.36**	.10	.17	**.43**	-.11	-.09	.13	**.45**	**.41**	-.12
NFC	.61, .15	57.98 (9.23)	**.31**	.18	.26	**.41**	.04	.05	.17	**.42**	**.39**	.06
STW	.51, .13	58.21 (9.85)	**.39**	.07	.21	**.48**	.06	.12	.14	.26	.28	.08
AXY	.58, .21	57.85 (15.63)	**.45**	.02	.29	**.39**	-.05	.01	.10	.18	.19	-.09
ANP	.72, .27	60.14 (11.23)	**.37**	.04	.16	**.57**	.08	.22	.25	.15	.23	.00
BRF	.67, .18	**67.51 (19.52)**	.28	-.04	.26	**.30**	-.08	.11	.20	.16	.24	.00
MSF	.70, .20	50.40 (9.60)	.21	-.06	.16	.20	-.17	.01	.14	.07	.20	-.05
JCP	.59, .19	50.59 (9.98)	.21	.03	.06	.24	**.48**	.16	.19	.03	.09	-.03
SUB	.62, .19	46.31 (7.78)	.08	.04	.06	.15	.26	.03	.11	-.01	-.03	-.03
AGG	.60, .14	55.64 (10.55)	.28	-.04	.18	**.43**	.26	.27	.18	.02	.06	.00
ACT	.64, .18	51.73 (11.44)	.12	-.06	.27	**.35**	.13	.21	**.36**	-.06	.10	.04
FML	.66, .17	58.76 (11.93)	**.45**	.15	.24	**.44**	.10	.27	.19	.21	.19	.08
IPP	.59, .12	50.60 (8.54)	.03	.14	.06	-.07	-.16	**-.38**=	-.24	.27	.21	-.14
SAV	.84, .34	52.12 (11.48)	.15	**.34**	.10	-.06	-.08	-.16	**-.34**=	**.57**	.09	.02
SHY	.68, .23	50.69 (9.34)	**.34**	.25	.22	.28	-.05	-.03	-.07	**.59**	.29	.11
DSF	.57, .17	64.81 (18.16)	.29	**.36**	.22	.13	.04	.13	-.13	**.31**	-.02	.12
PSY-5 Scales												
AGGR-r	.67, .10	51.14 (8.59)	.02	-.13	-.02	.13	.23	**.41**	.19	-.28	-.23	.07
PSYC-r	.72, .09	62.26 (15.06)	.27	-.06	**.48**	.27	.11	.24	.23	-.01	.02	.05

Table 2 (continued)

MMPI-2-RF Scales	Internal Consistency (alpha, MIC)	Total clinical sample	PPD	SPD	STPD	BPD	ASPD	NPD	HPD	APD	DPD	OCPD
DISC-r	.66, .09	51.69 (8.76)	.07	.08	.08	.23	**.45**	.21	.23	-.12	-.02	.00
NEGE-r	.78 .15	59.81 (10.65)	**.46**	.04	.26	**.59**	.04	.14	.25	.27	**.36**	.05
INTR-r	.79, .15	53.33 (11.10)	.17	**.33**	.01	-.03	-.10	-.27	**-.36**=	**.53**	.12	-.07

Bold correlations indicate meaningful associations; Underlined correlations represent positive hypothesized associations; Underlined correlations with a negative superscript represent negative hypothesized associations; MIC = Mean Inter-item Correlation; PPD = Paranoid Personality Disorder; SPD = Schizoid Personality Disorder; STPD = Schizotypal Personality Disorder; ASPD = Antisocial Personality Disorder; BPD = Borderline Personality Disorder; HPD = Histrionic Personality Disorder; NPD = Narcissistic Personality Disorder; APD = Avoidant Personality Disorders; DPD = Dependent Personality Disorders; OCPD = Obsessive–Compulsive Personality Disorder; HO = Higher Order; RC = Restructured Clinical; SP = Specific Problems; PSY-5 = Personality Psychopathology Five; EID = Emotional/Internalizing Dysfunction; THD = Thought Dysfunction; BXD = Behavioral/Externalizing Dysfunction; RCd = Demoralization; RC1 = Somatic Complaints; RC2 = Low Positive Emotions; RC3 = Cynicism; RC4 = Antisocial Behavior; RC6 = Ideas of Persecution; RC7 = Dysfunctional Negative Emotions; RC8 = Aberrant Experiences; RC9 = Hypomanic Activation; MLS = Malaise; GIC = Gastrointestinal Complaints; HPC = Head Pain Complaints; NUC = Neurological Complaints; COG = Cognitive Complaints; SUI = Suicide/Death Ideation; HLP = Hopelessness/Helplessness; SFD = Self-Doubt; NFC = Inefficacy; STW = Stress/Worry; AXY = Anxiety; ANP = Anger Proneness; BRF = Behavior-Restricting Fears; MSF = Multiple Specific Fears; JCP = Juvenile Conduct Problems; SUB = Substance Abuse; AGG = Aggression; ACT = Activation; FML = Family Problems; IPP = Interpersonal Passivity; SAV = Social Avoidance; SHY = Shyness; DSF = Disaffiliativeness; AGGR-r = Aggressiveness; PSYC-r = Psychoticism; DISC-r = Disconstraint; NEGE-r = Neuroticism/Negative Emotionality; INTR-r = Introversion/Low Positive Emotionality

marital status (X^2 (1, $N = 479$) = 0.221, $p = 0.638$; Cramer's V = 0.021), there were significant differences in terms of age (t(355.10) = 2.36, p < 0.01; Cohen's d = 0.22.), education (D(479) = 1.55, p = 0.016), and ethnicity (X^2 (4, $N = 479$) = 19.479, $p < 0.001$; Cramer's V = 0.202). More specifically, the findings showed that the invalid profiles were more strongly associated with reported non-Persian ethnicity as well as with lower values in age and educational level, compared to valid profiles.

The final sample consisted of 320 outpatient adults. The average age was 31.49 ± 8.25 years, and 161 (50.3%) were men. The number of patients recruited from each center ranged from 57 to 94. The mean level of education was 14.22 years, with 88.5% completing at least a high school degree. 57.5% were unmarried. Of the participants, 204 (63.8%) identified as Persian, 46 (14.4%) as Turkish, 27 (8.4%) as Lur, and 22 a (6.9%) as Kurd. Twenty-one participants (6.6%) reported belonging to other or multiple ethnic groups.[1] The DSM-5 Section II PD distribution, based on diagnoses derived from intake interviews, was 5.6% paranoid, 8.8% schizoid, 6.6% schizotypal, 16.3% borderline, 8.4% antisocial, 18.1% narcissistic, 6.6% histrionic, 8.4% avoidant, 5.3% dependent, and 15.9% obsessive–compulsive.

[1] This excluded sample included 70 (44%) women and 89 (56%) men, aged between 18 and 50 years old (Mean = 29.75, SD = 7.23). 59.7 percent of the participants were single, and 40.3% were married or in a relation. The self-reported ethnicities of participants were Persian (49.1%), Turkish (18.2%), Lur (9.4%), Kurd (5.0%), and 18.2% provided the response of "other ethnicities". Their mean level of education was 12.93 years, with 75.5% finishing at least a high school degree.

Notably, A written notice was provided to each participant in which we declared an approximate time of about three to 10 min for filling each page as well as the importance of answering to every question as much as possible. We also mentioned that they can answer the questions on two consecutive days if they cannot finish it in one sitting. Furthermore, all patients were volunteers and provided written consent for research participation. informed consent contained an explanation about the aim of the study, procedures and duration of the study, the right of volunteer to withdraw from the study, confidentiality of the personal data, the opportunity for the participants to ask any questions, and the contact details with the principal investigator. We also offered participants the test results as non-monetary compensation. All procedures of the current study were approved by the ethics committee of the University of Social Welfare and Rehabilitation Sciences.

Measures

Structured clinical interview for DSM-5-screening personality questionnaire (SCID-5-SPQ)

The SCID-5-SPQ (First et al., 2016) is composed of 106 items that are used to assess the criteria of the 10 DSM-5 Section II PDs. The items were completed with a true or false scale. Persian-language translation were used in this study. The translation procedure of the Persian version was via back-translation. Ghamkhar Fard et al. (2022) recently assessed the quality of psychometric properties of this version of the questionnaire; they reported generally acceptable

reliability and construct validity. The content and construct validity, as well as the Cronbach's alpha and mean interitem correlation of this version has been previously reported (Ghamkhar Fard et al., 2021a, b), demonstrating a generally acceptable psychometric properties for the investigated test. In the present study, relatively low levels of internal consistency (Cronbach's alpha and mean interitem correlation reliability) were achieved. The mean of Cronbach's alpha and mean interitem correlation were 0.45 and 0.11 for Cluster A PDs, 0.64 and 0.17 for Cluster B PDs, and 0.57 and 0.15 for Cluster C PDs. Table 1 shows internal consistency estimates for the SCID-5-SPQ.

Personality inventory for DSM-5 (PID-5)

PID-5 (Krueger et al., 2012) is a 220-item instrument designed to measure five higher-order domains of personality: Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism, and 25 lower-order pathological personality traits. The domains were evaluated through the first three relevant facets. Items are rated on a four-point Likert-type scale (i.e., 0 = *Very False or Often False* to 3 = *Very True or Often True*). A recent study (Ghamkhar Fard et al., 2021a, b) reported generally acceptable construct validity and internal consistencies for the Persian version of PID-5 (means of 0.76 for the coefficient alpha and 0.30 for the mean interitem correlation). Of note, the translation procedure to the Persian language included a back-translation. In this study, internal consistency in the majority of 25 facets was satisfactory; the Cronbach's alphas were above or well above the cutoff value of 0.7 (except Hostility, Submissiveness, Irresponsibility, Restricted Affectivity, Suspiciousness). Similarly, except for Suspiciousness, the mean interitem correlations were over 0.15, which is acceptable (see Table 1). Among the PID-5 facets, the mean average score for the Rigid Perfectionism was the highest such that 60.50% of the total sample scored over the 1.5 on this facet. The average scores for each of the PID-5 scales are indicated in Table 1.

Minnesota multiphasic personality inventory-2 restructured form (MMPI-2-RF)

The MMPI-2-RF (Ben-Porath & Tellegen, 2008) is a true–false 338-item self-report instrument designed to measure a range of constructs relevant to personality and psychopathology (Ben-Porath & Tellegen, 2008). It consists of 51 scales: nine validity scales, three Higher-Order (HO) scales, nine Restructured Clinical (RC) scales, 22 Specific Problems (SP) scales, two Interest Scales, and five Personality Psychopathology-Five (PSY-5) scales. The Persian version of the MMPI-2-RF, which was obtained from the University of Minnesota Press, was used for our Iranian sample. The translation to the Persian language was conducted by back-translation, bilingual test–retest Study, and normative and clinical data collection methods (Nezami et al., 1996, 2008). Of note, this version was previously validated by Ghamkhar Fard et al. (2022), reflecting generally acceptable psychometric properties (the mean of Cronbach's alpha for the HO Scales was 0.79, for the RC Scales was 0.77, for the SP Scales was 0.64, and for the PSY-5 Scales was 0.71. Except for the Interest Scales, all MMPI-2-RF scales were utilized in this study. In the present study, the MMPI-2-RF scales' Cronbach's alpha coefficients ranged from 0.69 (BXD) to 0.90 (EID) for the Higher-Order scales, 0.71 (RC4 and RC6) to 0.90 (RCd) for the Restructured Clinical scales, 0.51 (STW) to 0.84 (SAV) for the Specific Problems scales, and 0.66 (DISC-r) to 0.79 (INTR-r) for the PSY-5 scales, respectively (see Table 2). The hypothesized correlations between MMPI-2-RF substantive scales and DSM-5 Section II PDs are also underlined in Table 2.

Of the total sample, the mean T scores for RC6 (71.19), SUI (65.15), and BRF (67.51) were above the clinical elevation cutoff of 65 (Ben-Porath & Tellegen, 2008). Of these scales, RC6 had the most frequent elevation rate such that 62.20% of the total participants in our sample scored in the clinical elevation range. Mean T scores for the MMPI-2-RF substantive scales are listed in Table 2.

Data analysis

We first computed the degree of the association of DSM-5 Section II PDs with PID-5 and MMPI-2-RF scales using Spearman correlation coefficients. According to Cohen's effect size guidelines (Cohen, 1992), we considered medium or above values ($r \geq |.30|$) to be practically meaningful.

Next, hierarchical count (Poisson and negative binomial) regression models were fit to estimate the contribution of independent variables (PID-5 and MMPI-2-RF scales) in predicting DSM-5 Section II PDs. The predictors were entered step by step in all regression models. All hypothesized scales, regardless of their degree of correlation with SCID-5-SPQ symptom counts, were added to the model in the first step. In the second step, non-hypothesized scales those which had a correlation of ± 0.30 or above with DSM-5 Section II PDs were entered to evaluate the potential incremental predictive validity of those scales. Because the MMPI-2-RF scales are hierarchically organized, with items overlapping scales between but not within levels of the hierarchy, the scales of each level of the hierarchy were examined separately. Poisson and negative binomial models were fit for each predictor set, then compared using a set of goodness of fit statistics, namely, the Likelihood Ratio Testing (LRT), Akaike Information Criterion (AIC),

and the Bayesian Information Criterion (BIC), which were used to select the appropriate model (Harris et al., 2014; Payne et al., 2018). Chi-square likelihood ratio tests were also applied to evaluate the overall model fit and effect sizes related to the overall model fit. This analysis was conducted via SPSS 24.

To better understand how the DSM-5 Section II PDs are associated with maladaptive pathological personality traits and other clinical features, we evaluated the joint factor structure of SCID-5-SPQ along with PID-5 and MMPI-2-RF scales. Accordingly, exploratory structural equation modeling (ESEM) with maximum likelihood estimator and Geomin rotation was conducted through Mplus Version 7.4. Among the four sets of psychopathological scales in MMPI-2-RF (i.e., HO, RC, SP, and PSY-5, we focused on assessing the joint structure of PSY-5 scales, as the five scales of PSY-5 highly resemble five broad dimensions of the DSM-5 alternative model (Menton, 2016). To understand which factor structure model would be most appropriate for our data, we performed a series of ESEM and used model fit indices to identify the optimal number of factors to represent the data. We ran ESEM rather than the confirmatory factor analysis (CFA) which is known as the stubborn statistical analyses, restricts the number of permissible loading (Eaton et al., 2013; Hopwood & Donnellan, 2010). More specifically, it is assumed that the PDs and PDs traits could be better structured in a free loading factor model in which the variables are allowed to load on more than one factor (Hopwood & Donnellan, 2010; Marsh et al., 2014; Sellbom & Tellegen, 2019). Of note, the utility of approaches including ESEM in the assessment of PDs psychopathology has been supported in many studies (Marsh et al., 2014; Sellbom & Tellegen, 2019). Although we anticipated that results would support a five-factor model representing the five broad domains of the AMPD/PSY-5 models, we explored possible models ranging from three to eight factors. The goodness-of-fit index values taken to indicate good structural model fit included Comparative Fit Index (CFI) ≥ 0.90, Tucker Lewis Index (TLI) ≥ 0.90, Root Mean Square Error of Approximation (RMSEA) ≤ 0.08, and Standardized Root Mean Square Residual (SRMR) ≤ 0.08. Factor loadings greater than.|30| were deemed meaningful.

Results

Correlation and count regression analysis

The correlations of the DSM-5 Section II PDs with the PID-5 facets and MMPI-2-RF scales are respectively reported in Tables 1 and 2. Overall, the findings indicated strong associations between the scales that initially were expected to have meaningful relationships. For instance, for schizoid PD, except for the MMPI-2-RF EID scale, all the other hypothesized scales (PID-5 Detachment domain and Anhedonia, Intimacy Avoidance, Restricted Affectivity, and Withdrawal facets, as well as MMP-2-RF DSF, and INTR-r scales) were meaningfully associated with schizoid PD. Of note, MMPI-2-RF SAV also reached a correlation above |.30| with this PD. However, our results revealed some discrepancies between expectations and observations. For example, in terms of schizotypal PD, the PID-5 Psychoticism domain, PID-5 Eccentricity, Perceptual Dysregulation, and Unusual Beliefs & Experiences facets, and MMPI-2-RF THD, RC7, RC8, and PSYC-r scales had at least a moderate correlation with Schizotypal PD, as expected. However, some hypothesized scales (PID-5 Detachment domain, PID-5 Withdrawal, Restricted Affectivity, and Suspiciousness facets, and MMPI-2-RF EID, RC3, ACT, AXY, SHY, and NEGE-r) failed to have a meaningful association with schizotypal PD (see Tables 2 and 3).

As noted earlier, count regression analyses were also utilized to determine the predictive capability of PID-5 and MMPI-2-RF scales with respect to SCID-5-SPQ scales. We used nested, hierarchical models; the hypothesized predictor scales were entered in the first step, and any non-hypothesized scales that had a correlation above |.30| with the target DSM-5 Section II PD scale were entered in the second step. Regression equation models for predictors of DSM-5 Section II PDs are presented in Table 3. Raw scores of the PID-5 and MMPI-2-RF (as opposed to T-scores) were considered as the potential predictors of each of DSM-5 Section II PD. Poisson regression models were selected for all prediction criteria, except for antisocial and dependent PDs, which evidenced overdispersion. Overall, the results were somewhat consistent with what was expected, though some results diverged from expectations. For instance, in regression analyses of narcissistic PD, the PID-5 Antagonism domain and the PID-5 Grandiosity facet, as well as MMPI-2-RF BXD, THD, RC2 [-], RC9, IPP [-], FML, and AGGR-r scales substantially predicted this PD, which generally was not unexpected. The most divergence was assigned to OCPD in which only the PID-5 Disinhibition domain along with the PID-5 Perseveration, Rigid Perfectionism facets predicted this PD. Of note, all the entered MMPI-2-RF scales failed to emerge as meaningful predictors (see Table 3 for more details) of OCPD.

Exploratory structural equation modelling analysis

Overall, the conceptually expected common structure was obtained following the joint factor analysis of the three assessment instruments (i.e., SCID-5-SPQ, MMPI-2-RF PSY-5 scales, and PID-5). We concluded that among factor models, an eight-factor solution provided a best fit to

Table 3 Hierarchical Count Regression Analyses Summery for PID-5 Facets and MMPI-2-RF Scales Predicting DSM-5 Section II PDs

DSM-5 Section II PDs		LR Chi2	Pseudo R^2	BIC (First Step; Second Step)	Statistically Significant Hypothesized and Non-hypothesized Scales (Z; $e^{B\ Std.\ X}$)
Paranoid	MMPI-2-RF	89.45	.07	(1157.64; N/A)	*HO Scales:* EID (8.22; 1.03), THD (2.89; 1.03)
		97.31	.08	(1151.70; 1155.55)	*RC Scales:* RC7 (3.81; 1.04)
		106.09	.09	(1171.59; 1198.68)	*SP Scales*: FML (2.42; 1.04), DSF (2.05; 1.05), AXY (3.49; 1.11)
		67.26	.05	(1174.06; N/A)	*PSY-5 Scales*: NEGE-r (7.07; 1.06), PSYC-r (2.10; 1.02)
	PID-5	117.48	.10	(1157. 98; 1187.98)	*Facets*: Suspiciousness (3.89; 1.05), Hostility (2.14; 1.02)
		91.06	.07	(1156.05; 1161.79)	*Domains*: Negative Affectivity (5.14; 1.02), Detachment (4.56; 1.01)
Schizoid	MMPI-2-RF	14.31	.01	(1220.05; N/A)	*HO Scales:* EID (3.78; 1.01)
		36.36	.03	(1204.19; 1203.77)	*SP Scales*: DSF (3.53; 1.08), SAV (2.49; 1.03)
		23.76	.02	(1210.60; N/A)	*PSY-5 Scales*: INTR-r (4.91; 1.04)
	PID-5	76.35	.06	(1175.32; N/A)	*Facets*: Anhedonia (3.17; 1.02), Restricted Affectivity (2.20; 1.02), Withdrawal (2.15; 1.01)
		71.29	.06	(1163.07; N/A)	*Domains*: Detachment (8.53; 1.02)
Schizotypal	MMPI-2-RF	28.91	.02	(1152.98; N/A)	*HO Scales:* THD (4.60; 1.04); EID (2.45; 1.01)
		40.55	.03	(1147.11; N/A)	RC Scales: RC8 (5.02; 1.05), RC7 (2.37; 1.02)
		23.62	.02	1164.04; N/A)	*SP Scales*: ACT (2.79; 1.04), AXY (2.31; 1.06), SHY (2.22; 1.03)
		32.51	.03	1149.38; N/A)	*PSY-5 Scales*: PSYC-r (4.70; 1.04), NEGE-r (2.06; 1.01)
	PID-5	45.96	.04	1159.01; N/A)	*Facets*: Perceptual Dysregulation (2.35; 1.02), Unusual Beliefs & Experiences (2.27; 1.02)
		41.22	.03	1140.67; N/A)	*Domains*: Psychoticism (5.79; 1.01)
Borderline	MMPI-2-RF	135.76	.10	(1274.97; N/A)	*HO Scales:* EID (9.41; 1.03), BXD (5.26; 1.04)
		165.73	.12	(1252.16; 1268.07)	*RC Scales:* RC9 (3.73; 1.03), RCd (3.35; 1.03), RC7 (2.38; 1.02)
		173.79	.12	(1271.56; 1300.39)	*SP Scales:* ANP (3.86; 1.07), ACT (3.01; 1.05), AGG (2.29; 1.04)
		140.65	.10	(1270.08; N/A)	*PSY-5 Scales*: NEGE-r (10.28; 1.08), DISC-r (3.59; 1.03)
	PID-5	197.65	.14	(1246.68; 1282.30)	*Facets*: Hostility (3.63; 1.03), Separation Insecurity (2.95; 1.02), Emotional Lability (2.58; 1.02), Impulsivity (2.11; 1.02), Distractibility (2.30; 1.01)
		166.62	.12	(1248.36; 1249.88)	*Domains*: Negative Affectivity (5.26; 1.02), Disinhibition (4.78; 1.02), Psychoticism (2.08; 1.00)
Antisocial	MMPI-2-RF	75.57	.07	(970.87; N/A)	*HO Scales:* BXD (9.65; 1.19)
		101.49	.10	(950.72; N/A)	*RC Scales:* RC4 (10.39; 1.21)
		87.06	.08	(965.14; N/A)	*SP Scales*: JCP (8.60; 1.46), AGG (2.42; 1.10)
		78.76	.08	(973.44; N/A)	*PSY-5 Scales*: DISC-r (8.39; 1.21)
	PID-5	60.61	.06	(1020.44; N/A)	*Facets*: Risk Taking (3.20; 1.03), Callousness (2.64; 1.04), Impulsivity (2.17; 1.04)
		40.38	.04	(1011.82; N/A)	*Domains*: Antagonism (4.53; 1.03), Disinhibition (4.22; 1.03)
Narcissistic	MMPI-2-RF	30.49	.02	(1367.99; N/A)	*HO Scales:* BXD (4.06; 1.03), THD (2.30; 1.02)
		61.82	.04	(1338.95; 1336.66)	RC Scales: RC9 (5.74; 1.04), RC2 (-2.83; .98)
		59.63	.04	(1344.62; N/A)	*SP Scales*: IPP (-5.65; .93), FML (3.79; 1.04)
		51.80	.04	(1352.45; N/A)	*PSY-5 Scales*: AGGR-r (5.95; 1.05)
	PID-5	99.70	.07	(1311.19; 1316.09)	*Facets*: Grandiosity (5.63; 1.05)
		80.29	.06	(1312.42; N/A)	*Domains*: Antagonism (9.02; 1.02)

Table 3 (continued)

DSM-5 Section II PDs		LR Chi2	Pseudo R^2	BIC (First Step; Second Step)	Statistically Significant Hypothesized and Non-hypothesized Scales (Z; $e^{B\ Std.\ X}$)
Histrionic	MMPI-2-RF	33.77	.03	(1176.27; N/A)	*HO Scales:* BXD (5.89; 1.06)
		70.91	.06	(1150.66; N/A)	*RC Scales:* RC7 (3.73; 1.03) RC2 (-3.44; .95), RC9 (3.33; 1.03)
		78.19	.06	(1143.38; N/A)	*SP Scales*: SAV (-5.23; .93), ACT (3.94; 1.07), ANP (3.76; 1.07)
		54.30	.04	(1161.51; N/A)	*PSY-5 Scales*: INTR-r (-5.93; .95), PSYC-r (2.90; 1.03)
	PID-5	153.04	.13	(1186.62; 1085.84)	*Facets*: Attention Seeking (6.60; 1.06), Emotional Lability (1.96; 1.02), Restricted Affectivity (-3.55; .96)
		78.59	.07	(1139.22; 1142.98)	*Domains*: Antagonism (5.52; 1.02), Negative Affectivity (3.72; 1.01)
Avoidant	MMPI-2-RF	124.24	.10	(1165.11; N/A)	*HO Scales:* EID (11.02; 1.04)
		129.08	.10	(1169.57; 1171.81)	*RC Scales:* RC2 (5.91; 1.07), RC7 (2.20; 1.02)
		189.75	.15	(1120.00; 1139.98)	*SP Scales:* SAV (5.16; 1.08), SHY (3.21; 1.07), NFC (2.04; 1.04)
		119.27	.09	(1175.85; N/A)	*PSY-5 Scales*: INTR-r (9.27; 1.08), NEGE-r (4.74; 1.04)
	PID-5	162.71	.13	(1153.99; 1161.25)	*Facets*: Withdrawal (6.84; 1.05), Distractibility (2.10; 1.02)
		139.74	.11	(1156.44; 1161.14)	*Domains*: Detachment (9.49; 1.0.), Negative Affectivity (2.63; 1.01)
Dependent	MMPI-2-RF	65.92	.06	(1086.69; N/A)	*HO Scales:* EID (8.31; 1.05)
		76.59	.07	(1081.79; N/A)	*RC Scales:* RCd (4.23; 1.06), RC7 (2.04; 1.03)
		90.55	.08	(1091.55; 1085.13)	*SP Scales:* NFC (3.25; 1.11), BRF (2.20; 1.06), SFD (2.66; 1.13)
		47.32	.04	(1105.29; N/A)	*PSY-5 Scales*: NEGE-r (6.97; 1.11)
	PID-5	156.95	.14	(1024.33; 1024.50)	*Facets*: Separation Insecurity (8.17; 1.09), Submissiveness (4.04; 1.08), Distractibility (3.4316; 1.04)
		97.64	.09	(1064.63; 1060.74)	*Domains*: Negative Affectivity (5.81; 1.03), Disinhibition (3.12; 1.02)
Obsessive–Compulsive	MMPI-2-RF	None of entered MMPI-2-RF scales were emerged as a meaningful predictor			
	PID-5	64.15	.05	1251.06; N/A)	*Facets*: Rigid Perfectionism (6.36; 1.03), Perseveration (1.64; 1.01)
		5.80	.00	(1303.63; N/A)	*Domains*: Disinhibition (-2.12; .99)

Underlines refer the meaningful non-hypothesized scales; LR Chi2 = Likelihood Ratio Chi-Square; BIC = Bayesian Information Criterion; B Std. X = Unit enhance on criterion variable with respect to a 1-unit standard deviation increase on the predictor variable; PD = Personality Disorder; HO = Higher Order; RC = Restructured Clinical; SP = Specific Problems; PSY-5 = Personality Psychopathology Five; EID = Emotional/Internalizing Dysfunction; THD = Thought Dysfunction; BXD = Behavioral/Externalizing Dysfunction; RCd = Demoralization; RC2 = Low Positive Emotions; RC4 = Antisocial Behavior; RC7 = Dysfunctional Negative Emotions; RC8 = Aberrant Experiences; RC9 = Hypomanic Activation; SFD = Self-Doubt; NFC = Inefficacy; STW = Stress/Worry; AXY = Anxiety; ANP = Anger Proneness; BRF = Behavior-Restricting Fears; JCP = Juvenile Conduct Problems; AGG = Aggression; ACT = Activation; FML = Family Problems; IPP = Interpersonal Passivity; SAV = Social Avoidance; SHY = Shyness; DSF = Disaffiliativeness; AGGR-r = Aggressiveness; PSYC-r = Psychoticism; DISC-r = Disconstraint; NEGE-r = Neuroticism/Negative Emotionality; INTR-r = Introversion/Low Positive Emotionality

the data (CFI = 0.94, TLI = 0.90, RMSEA = 0.07; the 90% confidence interval = 0.061, 0.071, and SRMR = 0.03), and the joint factor loadings appeared theoretically coherent and interpretable. Of note, we refrain from using modification indices, leading to consider a model with 8 factors. These results are presented in Table 4. According to the findings, the first factor was defined by borderline and paranoid PDs along with MMPI-2-RF NEGE-r scale as well as the seven PID-5 facet scales, mostly within the Negative Affectivity domains. Of note, PID-5 Perseveration and Perceptual Dysregulation facets showed secondary loadings on this factor. A second factor was associated with scales with

Table 4 Results of Joint Structure of MMPI-2-RF PSY-5 Scales, PID-5 Facets, and DSM-5 Section II PDs Using Exploratory Structural Equation Modeling

	Factor Loadings							
	1	2	3	4	5	6	7	8
MMPI-2-RF PSY-5 Scales								
NEGE-r	**.75**	.00	-.04	.00	.06	-.08	-.32	.04
PSYC-r	.11	**.71**	-.21	-.06	.04	-.05	.02	.10
INTR-r	.25	-.11	**.62**	-.01	-.10	-.04	.14	-.11
DISC-r	.00	.02	-.35	**.56**	.14	-.05	.18	.05
AGGR-r	.09	.05	-.38	.06	**.47**	-.35	.00	.05
PID-5 Facets								
Depressivity	**.92**	-.02	-.10	.04	-.14	.02	.21	-.02
Anhedonia	**.74**	-.02	.08	.00	-.04	.06	.52	-.04
Anxiousness	**.68**	.03	.08	-.06	.02	.03	-.19	.13
Distractibility	**.51**	.00	.01	.37	-.15	.27	.03	.06
Hostility	**.50**	-.05	.07	.16	.44	-.16	-.27	.05
Separation Insecurity	**.47**	.02	-.35	-.21	.04	.35	.02	-.06
Suspiciousness	**.32**	.14	.13	-.07	.25	-.05	.00	.08
Unusual Beliefs & Experiences	-.23	**.88**	-.04	.05	-.01	-.03	-.07	-.05
Perceptual Dysregulation	.32	**.74**	-.01	.21	-.03	.04	.02	-.02
Eccentricity	-.01	**.61**	.08	.21	.08	-.03	.09	.09
Withdrawal	-.01	.12	**.86**	-.03	.25	.03	.09	.04
Intimacy Avoidance	.04	.05	**.50**	.22	.13	-.03	.14	.00
Risk Taking	-.07	.02	-.33	**.59**	-.01	-.23	.01	-.05
Impulsivity	.19	.06	.00	**.47**	-.04	.07	-.35	-.15
Irresponsibility	.21	.09	.04	**.38**	.11	.25	.02	-.22
Deceitfulness	-.04	-.02	-.03	.23	**.66**	.18	.03	-.13
Grandiosity	-.23	.13	-.02	-.09	**.65**	.06	-.04	.04
Callousness	.03	-.05	.40	.23	**.64**	-.08	.00	-.17
Manipulativeness	-.13	.19	-.22	.02	**.62**	.04	.07	-.06
Submissiveness	-.01	-.07	.02	.09	.03	**.59**	.01	.18
Attention Seeking	.11	.01	-.14	-.03	.41	**.51**	-.06	.06
Restricted Affectivity	.00	.15	.22	.06	.13	-.01	**.60**	.21
Emotional Lability	.24	.17	-.02	.31	.06	.10	**-.46**	.02
Rigid Perfectionism	.01	.05	-.01	-.17	.11	-.03	.01	**.76**
Perseveration	.32	.05	.12	.27	-.06	.18	-.05	**.46**
DSM-5 Section II PDs								
Borderline	**.56**	.12	-.13	.23	.07	.05	-.19	-.04
Paranoid	**.49**	.12	.17	-.05	.27	.00	-.04	-.02
Schizotypal	.00	**.61**	.19	.01	-.05	.12	-.09	.02
Avoidant	.22	.03	**.53**	-.01	-.04	.29	.02	.06
Schizoid	.09	.05	**.32**	.12	-.05	-.01	.31	.13
Antisocial	-.03	-.18	-.06	**.53**	.14	-.02	-.03	.06
Narcissistic	-.01	-.03	-.04	-.06	**.64**	.08	-.03	.10
Dependent	.29	-.13	.01	.02	-.03	**.50**	-.04	-.05
Histrionic	.02	.02	-.29	.07	.27	**.43**	-.19	.01
Obsessive–Compulsive	-.02	-.14	-.03	.04	.01	.02	.05	**.69**

Bold values indicate the highest factor loading for each variable; Underlined values indicate secondary factor loadings of |.30| or greater; PD = Personality Disorder; PSY-5 = Personality Psychopathology Five; AGGR-r = Aggressiveness; PSYC-r = Psychoticism; DISC-r = Disconstraint; NEGE-r = Neuroticism/Negative Emotionality; INTR-r = Introversion/Low Positive Emotionality

thought problem content (PSYC-r from the MMPI-2-RF PSY-5 scales, Unusual Beliefs & Experiences, Perceptual Dysregulation, and Eccentricity from the PID-5 facets, and schizotypal PD from the SCID-5-SPQ. The third factor was defined by the MMPI-2-RF INTR-r scale, as well as two PID-5 Detachment facets (i.e., Withdrawal and Intimacy Avoidance) and DSM-5 Section II schizoid and avoidant PDs. Negative secondary loadings of MMPI-2-RF DISC-r and AGGR-r scales along with PID-5 Separation Insecurity and Risk-Taking facets, as well as positive secondary loadings of PID-5 Callousness facet emerged on this factor. Next, the scales that loaded on the fourth factor had disinhibited-externalizing content (i.e., MMPI-2-RF DISC-r scale, PID-5 Risk Taking, Impulsivity, and Irresponsibility facets, and DSM-5 Section II antisocial PD). Of note, PID-5 Distractibility and Emotional Lability facets demonstrated a meaningful secondary loading in this factor. The MMPI-2-RF AGGR-r scale, PID-5 Deceitfulness, Grandiosity, Callousness, Manipulativeness facets, as well as DSM-5 Section II narcissistic PD, loaded strongly on the fifth factor, reflecting antagonistic externalizing problems. It should be noted that PID-5 Hostility and Attention Seeking cross-loaded secondarily onto this factor, which is conceptually intuitive. The sixth factor contained Dependent and Histrionic PDs, and PID-5 Submissiveness and Attention Seeking facets. The MMPI-2-RF AGGR-r scale (negatively) and PID-5 Separation Insecurity facet displayed a cross-loading on this factor, as well. In terms of the seventh factor, the PID-5 Emotional Lability (negatively) and Restricted Affectivity facets loaded together onto this factor. We should note that the MMPI-2-RF NEGE-r scale (negatively), PID-5 Impulsivity (negatively) and Anhedonia facets as well as schizoid PD secondarily loaded into this factor. Finally, the eighth factor was indicated by three primary components, PID-5 Rigid Perfectionism and Perseveration facets, and SCID-5-SPQ OCPD, representing the concept of Anankastia.

Discussion

This paper had two major goals. First, we primarily aimed at predicting the DSM-5 Section II PD symptoms, as operationalized by the SCID-5-SPQ, using the PID-5 and MMPI-2-RF in a sample of 320 Iranian outpatients. To achieve this aim, we conducted correlation analyses and a set of hierarchical count regression models to explore whether our hypothesized associations would be supported in the current sample. The results were highly consistent with our initial hypotheses, with some minor exceptions, offering a clinical picture of DSM-5 Section II PDs from the perspective of the PID-5 and the MMPI-2-RF in this sample. The second aim of the current study was to evaluate the joint structure of DSM-5 Section II PDs along with the MMPI-2-RF PSY-5 scales and PID-5 facets through ESEM analysis. Results of these analyses revealed generally interpretable patterns of factor loadings across our data. These findings add to a large but growing body of research linking dimensional models of personality and psychopathology to categorical personality disorder diagnoses. We discuss these findings in detail.

As noted, the pattern of associations between DSM-5 Section II PDs and PID-5 and MMPI-2-RF scales were generally congruent with expectations. For instance, in terms of schizotypal PD, as expected, scales with thought disorder-related content were represented with the highest effect sizes in both measures, consistent with the core features of this PD. Similarly, narcissistic PD had greater associations with antagonistic externalizing scales, which clearly described the core features of this PD. These correlations are consistent with past works (Ghamkhar Fard et al., 2021a, b; Morey et al., 2015), demonstrating that these dimensional traits predict conceptually related categorical PDs across cultures. However, we should note that while a few hypothesized correlations were not obtained, a set of non-hypothesized scales showed meaningful correlations with a number of PDs, most notably paranoid and borderline PDs. For instance, for paranoid PD, while some hypothesized scales (i.e., PID-5 Intimacy Avoidance and Unusual Beliefs & Experiences, along with MMPI-2-RF BXD, THD, AGG, and PSYC-r) did not evidence meaningful correlations, a wide range of non-hypothesized scales, which mostly belong to the internalizing domain, had meaningful associations in our study. Among the many possible explanations for this finding, this could reflect an important internalizing component to paranoid PD, a measurement problem in the SCID-5-SPQ paranoid PD items, or a selection effect, as the sample comprised help-seeking patients in a mental health setting. Likewise, in terms of count regression models, although the findings strongly corroborated our initial expectations, the predictive roles of some hypothesized scales were not supported, and, conversely, a few non-hypothesized scales emerged as significant predictors. However, the added non-hypothesized predictors were nevertheless generally conceptually relevant to the target construct. For instance, the PID-5 Restricted Affectivity facet reached meaningful effect size in the negative prediction of histrionic PD, which could be conceptually related to the distinctive interpersonal and affective patterns characteristic of people with a histrionic PD diagnosis.

Overall, we expected that the results of PID-5 and MMPI-2-RF analyses would be congruent with each other, which was the case, with a few exceptions. For instance, although the MMPI-2-RF scales showed a pattern of expected convergent and discriminant associations with avoidant PD, among the PID-5 scales, only the Withdrawal and Distractibility facet played a role in the prediction of that PD. We should note that both PID-5 and MMPI-2-RF provided little coverage for Section II obsessive–compulsive PD features. Our

findings were in line with previous studies which have found that the items of both measures, particularly the MMPI-2-RF, generally do not well cover core features of obsessive–compulsive PD (Anderson et al., 2015a, b).

Overall, we obtained clinical elevations on RC6, SUI, and BRF in our Iranian clinical sample, in which the RC6 was the most elevated. We should also highlight that a previous work on Iranian community sample revealed a clinical elevation on BRF (Ghamkhar Fard et al., 2022), reflecting the increased fear and stress in the MMPI-2-RF profile picture of Iranians. As noted, in our clinical sample, we also found elevated scores in RC6 (Ideas of Persecution) and SUI (Suicide/Death Ideation) scales across many Iranian patients with PDs, which would be considered as the primary risk factor of DSM-5 Section II PDs in the Iranian population.

We also conducted a joint exploratory factor analysis to examine how the DSM-5 Section II PDs covary with the PID-5 facet scales and the MMPI-2-RF PSY-5 scales. The resulting ESEMs generally fit well with theory as well as with emerging dimensional models of psychopathology such as the HiTOP model (Ghamkhar Fard et al., 2023; Kotov et al., 2017; Krueger et al., 2012; Ruggero et al., 2019). However, we also found some unexpected factor loadings for some scales, which are addressed below.

In a series of ESEM analyses exploring joint factor models for the DSM-5 Section II PDs along with PID-5 facets and MMPI-2-RF PSY-5 scales, the best-fitting model corresponded to the eight factor-model, which produced an interpretable pattern of factor loadings. More specifically, the first five factors corresponded to five broad domains roughly approximating the PSY-5 and PID-5 models. The most important deviations were related to the four omitted PDs from DSM-5 Section III (i.e., paranoid, schizoid, histrionic, and dependent). For instance, histrionic and dependent PDs were loaded together primarily along with PID-5 Submissiveness and Attention Seeking facets. Of note, cross-loadings of MMPI-2-RF AGGR-r scale (negatively) and PID-5 Separation Insecurity facet (positively) were also identified among this factor, reflecting the manifestation of concerning or unwillingness to engage in interpersonal conflict. Almost similarly, schizoid PD primarily loaded on a detachment-related factor along with avoidant PDs, the two of PID-5 detachment traits (i.e., Withdrawal and Intimacy Avoidance), and the MMPI-2-RF INTR-r scale, which all were consistent with the expectations based on previous delineation of the detachment construct (Kotov et al., 2017). Schizoid PD loaded secondarily on other factor along with PID-5 Emotional Lability (negative state) and Restricted Affectivity. The MMPI-2-RF NEGE-r (negatively), as well as PID-5 Impulsivity (negatively) and Anhedonia cross-loaded onto this factor. These results suggest that although some symptoms of schizoid and avoidant PDs are closely associated with one another, the schizoid PD has also unique features which distinguishes this PD from avoidant PD.

DSM-5 Section II obsessive–compulsive PD did not load on any of the five MMPI-2-RF PSY-5 scales. In this regard, although a domain of compulsivity which was highly concordant with ICD-11 Anankastia domain had been initially considered by the DSM-5 P&PD Workgroup, it was ultimately removed to achieve the aim of presenting a simplified personality model (Skodol, 2012). Bach et al. (2018) nevertheless suggested that the ICD-11 domain of Anankastia could be somewhat assessed by the DSM-5 facets of perseveration and rigid perfectionism. Consistent with this, in our study obsessive–compulsive PD was loaded along with these two facets onto the eighth factor, highlighting the distinctive nature of obsessive–compulsive PD, which does not appear to fall cleanly within the five-factor PSY-5/PID-5 model.

This study has several implications for both researchers and clinicians. First, our findings provide unique insights on measuring DSM-5 Section II PDs through the PID-5 and MMPI-2-RF in the Iranian clinical community. Accordingly, although the findings were somewhat consistent with previous studies using samples from different cultures (Anderson et al., 2015a, b; Sellbom & Smith, 2017), some differences were also observed, indicating possible cultural contributions on the manifestations of PDs. Besides, due to the elevations on some of MMPI-2-RF T-score scales in both community and clinical Iranian sample, it seems that the cultural issues may affect the T-score variations, reflecting the necessity of examining the MMPI-2-RF T- scores to the Iranian population. Finally, in terms of ESEM results, using both PID-5 and MMPI-2-RF for factor analysis has provided useful information regarding the structure of personality pathology features, as assessed by multiple major self-report instruments. More specifically, the present results increase confidence that in Iranian clinical populations these measures tap into common underlying features that are relevant to understanding clinical presentations of personality pathology from the perspectives of both the DSM-5 Section II categorical PD system and alternative dimensional models of personality and psychopathology such as the PSY-5 and AMPD. Accordingly, the Persian-speaking clinicians can incorporate these measurement tools into their practice to improve the assessment and treatment of personality disorders in this population. The results of this study, particularly could develop tailored interventions that address both the core features of personality disorders and the broader psychopathological dimensions.

The results of the current study should be addressed in light of some limitations. First, the DSM-5 Section II PD operationalizations used in the present study relied on a self-report measure (the SCID-5-SPQ), as the initial diagnostic interviews were not standardized across clinicians. Accordingly, future research should utilize structured interviews

(e.g., the SCID-5 PD interview) to enhance the accuracy of the assessment. Second, the SCID-5-SPQ revealed low internal consistency for some scales, generally in the same range as those reported in previous studies (Finn et al., 2014; Sellbom & Smith, 2017), which this limitation could have an effect on our findings. Third, as our study focused on those diagnosed with at least one of the ten main PDs of DSM-5 Section II, it is unclear to what extent our findings generalize to individuals with significant personality pathology who cannot be readily categorized within any of the ten specified DSM diagnoses (for example, those who might be diagnosed with other specified PD or unspecified PD). Future researchers could take into account the possibility of collecting data from these types of unspecified personality diagnoses and integrating them into their analysis to explore the potential similarities versus deviations from our findings.

Finally, due to the particular scope of the present study and the limited availability of research considering private health data, we were unable to include individuals in our clinical sample who would meet the diagnostic criteria of a main personality disorder together with other comorbid mental illnesses. It would have been beneficial to complete a detailed chart review that would have included other comorbid diagnoses. Nevertheless, our study is one of the first studies in its kind and having taken into account the comorbidity of other psychological disorders would have complicated the results. Therefore, having provided initial evidence of the targeted associations, we suggest that future studies explore the possible co-occurrence of PDs with one another and the comorbidity of them with other clinical disorders as well as broader issues related to differential diagnosis. We furthermore recommend incorporating individuals with severe mental illness who have not recently experienced a severe psychotic condition into the research sample, helping to understand the nature of their comorbidities with certain PDs.

These caveats notwithstanding, the results of this study provide beneficial insight into and add to the existing literature on measuring the DSM-5 Section II PDs by identifying patterns of associations between those PDs and two broadband dimensional instruments, the MMPI-2-RF and the PID-5, in a non-western country. Therefore, it is hoped that our findings lay the groundwork for Persian-speaking clinicians and researchers to apply these measures in the future research, accurate assessment and evidence-based treatment of their clients who are struggling with PDs. Furthermore, due to the largely similar theoretical framework of the MMPI-2-RF with the MMPI-3 (Ben-Porath and Tellegen, 2008), the latest version of the MMPI family of tests, as well as the close empirical associations between these two instruments, our results would likely extend to a Persian-language version of the MMPI-3, if one were to be created.

Data availability The datasets generated and/or analyses during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval All procedures performed in our studies which involved human participants were in accordance with the ethical standards of the institution and/or the national research committee. This article does not contain any studies with animals performed by any of the authors. Author identifying information on the title page that is separate from the manuscript.

Informed consent Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declared no conflicts of interest with respect to the authorship or the publication of this article.

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