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Original article

Predicting DSM-5 Section III personality disorders using MMPI-2-RF in an Iranian non-clinical sample

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SUMMARY

Objectives

The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) Section III includes an alternative model for diagnosing six personality disorders (PDs) with evaluating functional impairment (Criterion A) as well as 25 maladaptive personality facets (Criterion B). The Personality Inventory for DSM-5 [1] was developed by the DSM-5 Personality and Personality Disorders workgroup to assess Criterion B of this new model. The aim of the current study was to examine the prediction DSM-5 Section III PD trait combinations using the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF [2]); a frequently used measure of personality and psychopathology with a strong relation with contemporary models of personality.

Methods

The sample consisted of 536 (209 men, 327 women) individuals who were recruited through the general population in Iran.

Results

Hierarchical linear regression analyses indicated that the DSM-5 Section III PD trait combinations could be predicted using the MMPI-2-RF in an Iranian population, with several divergences.

Conclusions

As expected, the majority of hypothesized scales had the largest effect sizes in the prediction of Criterion B of DSM-5 Section III PDs. This finding has implications for assessing the alternative model for personality disorders (AMPD) using the MMPI-2-RF in this population.

Key words: DSM-5 Section III, MMPI-2-RF, personality disorders, maladaptive personality traits

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Predicting DSM-5 Section III personality disorders using MMPI-2-RF in an Iranian sample

The current categorical model for personality disorders (PDs) in the *Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5* [3]*)*, includes 79 criteria for diagnosing 10 PDs. Though this model has persisted across versions of the DSM, the large number of diagnostic criteria and other underlying problems have restricted its clinical application [4,5]. For instance, in this traditional nosology, individuals who exhibit functional impairment but are below the diagnostic threshold of symptoms are either not classified by the Section II model or fall under the "catch-all" category of Unspecified Personality Disorder, which could be uninformative in developing treatment strategies in a clinical setting [6]. Similarly, several characteristics such as avoidance, perfectionism, and disrespect for

others are not well described by any of the diagnostic classes in the categorical model, highlighting a gap in the coverage of pathological personality as conceptualized by this model, which probably distort the results of research and also undermine effective diagnosis and therapeutic intervention [7]. When such problems are considered, the limitations of a categorical system of PD diagnosis becomes clear, leading some opponents of this model to disregard these PD diagnoses that might be helpful in a clinical setting [8].

To reduce the gap between assessment and intervention and provide conditions for more effective treatment based on individual pathological domains, the DSM-5 Personality and Personality Disorders workgroup proposed an alternative model of diagnosing six PDs (i.e., antisocial, avoidant, borderline, narcissistic, obsessive-compulsive [OCPD], and schizotypal). The crucial change in this revised system was emphasis on a dimensional approach for the assessment of symptoms [3]. This shift towards a dimensional model helps clinicians present therapeutic protocols based on a specific patient's current reality, rather than on a diagnosis created from aggregate patient experiences [9]. The new model was designed to assess impairment in personality functioning (Criterion A), and pathological personality traits (Criterion A). Criterion B of the alternative model comprises of twenty-five personality traits, which are classified into five broad pathological domains named Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism. These domains strongly resemble the Five Factor Model (FFM [10]).

Despite maximal agreement in the utility of dimensional modeling, the model was relegated to DSM-5 Section III for future research [3]. Therefore, examining the associations of this model with other personality assessment measures may assist in moving towards us a more valid, useful, and replicable model. In this study, we examined the capacity of the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF [2], one of the most frequently applied instruments, in predicting DSM-5 Section III traits PDs across an Iranian nonclinical sample. As the MMPI-2-RF provides useful information on mood, adjustment, and clinical problems [2,11], this study would provide an integrated view of PD assessment. More importantly, because of the hierarchical structure of MMPI-2-RF, which has focused on a dimensional approach in measuring psychopathology, this study would assist to better understand the validity of the alternative model of PDs. Furthermore, as noted, because of the cost-effectiveness and frequently usage of MMPI measures in various setting [12], knowing how the MMPI-2-RF assesses DM-5 Section III PDs would be valuable for the utility of the MMPI-2-RF as much as the utility of the AMPD. Of note, as we did not examine the criterion A of AMPD, this study did not cover all the issues of the new model; to evaluate the DSM-5 Section III PDs, we exclusively focused on pathological traits (Criterion B). This study is especially important in Iranian society, a country with a different cultural background from Western countries, which adheres to the collectivistic and Islamic values acquired from the early years through a socialization process [13]. The published researches on this area [14], showed the general continuity between Criterion B of DSM-5 Section III PDs and MMPI-2-RF scales. However, as the environmental factors might play an important role on presentation of a PD [15], more research is needed, particularly within a population that is drastically underrepresented in the literature. With this respect, we hypothesized that cultural context might also come into play such that the role of MMPI-2-RF scales would be influenced by sample characteristics. Furthermore, applying Persian version of MMPI-2-RF across Iranian culture would help increase clinical utility of this instrument in the assessing and diagnosing PDs, which is flexible with cultural variation.

Methods

Participants and procedure

The sample included of 724 individuals aged 18-55 who were selected by a quota sampling method from general population in Iran. The sample was recruited from four regions in Tehran including north, east, west, and south. 188 participants who had invalid profiles based on the guidelines provided in the MMPI-2-RF protocol (here defined by CNS ≥ 15, VRIN-r ≥ 80T, TRIN-r ≥ 80T, F-r ≥ 120T, Fp-r ≥ 100T; see [2]), were excluded from the study. To estimate possible bias related to excluding invalid data, we compared the valid and full sample in terms of demographic characteristics, indicated no significant differences in demographic variables between valid and full profiles. Of note, ethics committee approval was obtained before the study was undertaken.

Measure

MMPI-2-RF

The MMPI-2-RF [2] is a 338-item self-report inventory, which is answered in a true–false format. This inventory designed to measure nine validity scales, 3 Higher-Order (HO) scales, 9 Restructured Clinical (RC) scales, 23 Specific Problems (SP) scales, two Interest scales, and 5 Personality Psychopathology Five (PSY-5) scales. Participants were administered the Persian version of the MMPI-2-RF, which was provided by the permission of University of Minnesota Press. This version indicated acceptable psychometric properties in previous research [16]. In the current study, the mean of Cronbach's coefficients alpha were .79, .77, .64, and .71 for the HO,

RC, SP, and PSY-5 scales, respectively. Cronbach's alpha for MMPI-2-RF PDs scales ranging between .56 and .87 (average alpha = .72).

PID-5

The PID-5 [1] is a 220-item self-report inventory developed to assess the maladaptive personality facets of alternative model. Item responses are based on a 4-point Likert-type scale ranging from 0 (*Very False or Often False*) to 3 (*Very True or Often True*). It consists of 25 pathological personality traits and five domains. The acceptable psychometric properties for Persian version have been demonstrated in previous research [17]. Cronbach's alpha for the PID-5 domain scales were .64 (Detachment), .70 (Negative Affectivity), .75 (Antagonism), .74 (Disinhibition), and .81 (Psychoticism). The mean Cronbach's alpha for the 25 facets was .73. The *DSM-5* Section III PDs were calculated by aggregating the PID-5 facets suggested for each PD (see, e.g. [18]). Of note, under this evaluation strategy, only the traits of AMPD were considered for measuring PDs. For these scores, Cronbach's alpha ranging between .60 (OCPD) and .79 (antisocial and borderline PDs), with an average alpha of .71.

Data analysis

Pearson correlation analyses were conducted to examine the associations between MMPI-2-RF scales as well as MMPI-2-RF PDs scales with DSM-5 Section III PDs. As a small effect size was statistically significant in the current study, we focused on correlations of a moderate (r = l.30-.49l) or large ($r \geq$ l.50l) effect size as meaningful (see [19]).

We next used a series of hierarchical linear regression analyses to predict each of the six DSM-5 Section III PDs using MMPI-2-RF scales. As noted, the traits of DSM-5 Section III PDs were characterized through the PID-5 pathological personality trait combinations. Due to item overlap across levels of the MMPI-2-RF hierarchy, the HO, RC, SP, and PSY-5 scales were entered separately to the regression equations. The MMPI-2-RF scales were entered into the regression equations step by step; the hypothesized MMPI-2-RF scales with at least medium correlations (r ≥ l.30l) with DSM-5 Section III PD were entered in the first step. Of note, the hypothesized scales were selected based on the theoretical concept of DSM-5 Section III PDs constructs onto MMPI-2-RF scales, which has also been tested in recent research [14]. Our hypothesized MMPI-2-RF scales are listed in Table I. In the second step, we entered the non-hypothesized MMPI-2-RF scales with an association greater than ••.30l, to examine whether additional MMPI-2-RF scales would augment the prediction of DSM-5 Section III PDs.

TABLE I. *DSM-5 Section III personality disorders and hypothesized MMPI-2-RF scales associations.*

DSM-5 Section III personality disorders	MMPI-2-RF scales			
	HO scales	RC scales	SP scales	PSY-5
Antisocial	BXD	RC3, RC4, RC9	AGG, ANP, IPP (-), JCP, SHY (-), SUB	AGGR-r, DISC-r
Avoidant	EID	RCd, RC2, RC7	AXY, DSF, MLS, NFC, SAV, SFD, SHY, STW	INTR-r, NEGE-r
Borderline	BXD, EID, THD	RCd, RC2, RC4, RC7, RC9	ANP, AGG, AXY, COG, FML, HLP, SFD, STW, SUI	DISC-r, NEGE-r, PSYC-r
Narcissistic	BXD	RC4, RC9	ACT, AGG, IPP (-), NFC (-), SAV (-), SFD (-)	AGGR-r
Obsessive-compulsive	EID	RCd, RC2, RC4, RC7	COG, DSF, NFC, SAV, STW	NEGE-r
Schizotypal	EID, THD	RCd, RC2, RC6, RC8	COG, DSF, NUC, SAV	INTR-r, NEGE-r, PSYC-r

Abbreviations. 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; RC3: Cynicism; RC4: Antisocial Behavior; RC6: Ideas of Persecution; RC7: Dysfunctional Negative Emotions; RC8: Aberrant Experiences; RC9: Hypomanic Activation; MLS: Malaise; 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; 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

Results

The final sample was composed of 536 participants, including 209 men and 327 women with a mean age of 34.19 years (SD = 9.78). 45.1% were single, 52.2% were married, and 2.6% were divorced. 12.9% had less than a diploma, 39.2% had a diploma, 26.5% had a bachelor's degree, 20.3% had a master's degree or higher, and 1.1% did not declare their degree.

Table II shows the correlations between DSM-5 Section III PDs with MMPI-2-RF scales. Although there were several non-hypothesized correlations, the hypothesized correlations generally showed the largest effect sizes. We also evaluated correlations between DSM-5 Section III PDs and MMPI-2-RF PDs scales. The findings indicated support for expected associations of MMPI-2-RF PDs scales with their respective DSM-5 Section III PDs. The exception to this pattern was the MMPI-2-RF OCPD scale that in addition to its respective DSM-5 Section III PDs, it unexpectedly associated with DSM-5 Section III avoidant and borderline PD with a large magnitude.

Consistent with correlation analyses, the hypothesized MMPI-2-RF scales generally contributed to the prediction of their Section III PD counterparts. However, some non-hypothesized MMPI-2-RF scales accounted for a unique amount of variance. These results are shown in Table III*.

Consistent with expectations, the majority of hypothesized MMPI-2-RF scales (BXD, RC9, RC4, IPP [low], JCP, AGG, SUB, ANP, DISC-r, and AGGR-r) contributed to the prediction of antisocial PD. In the second step, EID, THD, RCd, COG, ACT, FML, NEGE-r, and PSYC-r added to the prediction of this PD, albeit the hypothesized scales were generally the best predictors. For avoidant PD, except for SFD, the other hypothesized scales (EID, RCd, RC2, RC7, SAV, DSF, STW, AXY, NFC, MLS, SHY, NEGE-r, and INTR-r) were unique predictors, reflecting internalizing problems in this PD. In the second step, RC3, HLP, SUI, and PSYC-r also added to this prediction. For borderline PD, the majority of entered hypothesized scales (EID, BXD, THD, RCd, RC9, RC4, RC7, SFD, ANP, STW, SUI, COG, AGG, HLP, FML, NEGE-r, PSYC-r, and DISC-r) contributed meaningfully to this prediction. In the second step, ACT was added as a predictor of this PD. In the prediction of narcissistic PD, BXD, RC9, ACT, IPP (low), and AGGR-r were considered in the regression models due to their meaningful effect sizes. Among these meaningful scales, the RC9 was the best predictor, which accounted for 37% of the variance in this PD. The second steps of regression equations showed that THD, RC6, PSYC-r, and DISC-r emerged as significant contributors. In terms of OCPD, in the first steps of regression equations, a series of hypothesized scales (EID, RC7, RCd, DSF, STW, NFC, and NEGE-r) contributed to the prediction of this PD. In the second step, THD, RC8, RC3, RC6, FML, and PSYC-r emerged incrementally as a significant predictor. Finally, for Schizotypal PD, the first step of regression models indicated THD, EID, RC8, RCd, RC6, DSF, COG, PSYC-r, and NEGE-r accounted for variance. In the second step, BXD, RC3, RC4, ACT, SHY, SUI, FML, and DISC-r predicted this PD, albeit with generally smaller effect sizes than hypothesized scales.

Discussion

In the current study, we first aimed to examine the associations between DSM-5 Section III PDs and MMPI-2-RF scales. The findings showed evidence for predicting traits of DSM-5 Section III using the majority of hypothesized scales. We then examined the association between MMPI-2-RF PDs scales and DSM-5 Section III PDs, indicating although the expected correlations were generally meaningful with a strongest effect size, MMPI-2-RF OCPD scale was not met this pattern. This finding is consistent with Sellbom, Waugh [20] research, and may be due to that fact that items with negative emotionality content are considered as a crucial criterion for measuring MMPI-2-RF OCPD scale. Indeed, because negative emotionality is considered a prominent trait across several PDs, the large correlations of this MMPI-2-RF PD scale with other PDs (i.e., avoidant and borderline PDs) may be due to the content similarity. However, it must be emphasized that the expected correlations for the rest of five MMPI-2-RF PDs scales could still reflect the capacity of the MMPI-2-RF for direct assessment of DSM-5 Section III PDs.

As explained, the majority of hypothesized scales had the largest effect sizes in the prediction of Criterion B of DSM-5 Section III PDs. Our findings were generally consistent with previous research [21], with some exceptions. For instance, narcissistic PD had meaningful associations with MMPI-2-RF externalizing scales. These results support traits of narcissistic PD in the alternative model. However, a series MMPI-2-RF scales which referred to thought problems also emerged, probably reflecting preoccupation with fantasies of unlimited success which clearly differ from regular thinking. Another possible explanation could be that thought problems is not considered as psychotic and pseudo-psychotic symptoms exclusively, and it would be also reflected having much different thoughts and beliefs from the rest of people in society, which clearly contradict the culture.

* To present more clarity findings, we exclusively mentioned those non-hypothesized scales which significantly contributed to the prediction of PDs in the table. Full data are available on request from the authors.

TABLE II. *Pearson correlations between DSM-5 Section III PDs and MMPI-2-RF scales.*

MMPI-2-RF Scales	ASPD	APD	BPD	NPD	OCPD	STPD
HO scales						
EID	.35	**.72**	**.69**	.13	.38	.42
THD	.41	.29	.46	.37	.42	**.61**
BXD	**.64**	.17	.48	.36	.20	.43
RC scales						
RCd	.41	**.68**	**.73**	.20	.43	.48
RC1	.22	.34	.41	.08	.19	.30
RC2	-.06	.49	.20	-.24	.06	.06
RC3	.44	.47	**.52**	.36	.43	**.53**
RC4	**.55**	.25	.47	.27	.21	.40
RC6	.43	.33	.47	.37	.39	**.58**
RC7	.41	**.60**	**.68**	.31	.47	**.50**
RC8	.41	.26	.46	.35	.43	**.62**
RC9	**.59**	.20	**.53**	**.50**	.34	**.50**
SP scales						
MLS	.25	**.50**	.48	.05	.22	.25
GIC	.08	.20	.22	.01	.12	.16
HPC	.17	.22	.31	.05	.12	.20
NUC	.29	.30	.39	.12	.20	.33
COG	.39	.46	**.56**	.14	.29+	.44
SUI	.24	.40	.45	.06	.25	.32
HLP	.28	**.54**	**.56**	.13	.32	.33
SFD	.25	**.50**	**.58**	.10	.27	.31
NFC	.28	**.52**	**.51**	.18	.40	.38
STW	.38	**.54**	**.61**	.28	.36	.37
AXY	.20	**.42**	.46	.16	.29	.32
ANP	.43	.35	**.57**	.27	.21	.28
BRF	.08	.26	.32	.15	.21	.22
MSF	-.05	.17	.16	.01	.04	.01
JCP	.41	.08	.28	.18	.08	.26
SUB	.31	.08	.18	.06	.06	.15
AGG	.45	.29	**.47**	.26	.25	.35
ACT	.34	.07	.36	.36	.24	.40
FML	.38	.42	**.55**	.27	.34	.42
IPP	-.31	.05	-.12	-.32	-.20	-.19
SAV	.02	.40	.04	-.07	.14	.16
SHY	.19	**.50**	.39	.15	.33	.34
DSF	.24	.47	.24	.11	.39	.38
PSY-5 scales						
AGGR-r	.44	.00	.22	.37	.20	.27

TABLE II. *continue*

MMPI-2-RF Scales	ASPD	APD	BPD	NPD	OCPD	STPD
PSYC-r	.39	.33	.46	.37	.44	**.63**
DISC-r	**.59**	.10	.39	.32	.17	.40
NEGE-r	.37	**.56**	**.67**	.29	.38	.40
INTR-r	-.11	.39	.00	-.27	.04	.00
MMPI-2-RF PDs scales						
Antisocial	**.68**	.26	**.54**	.37	.28	.49
Avoidant	.21	**.59**	.44	.13	.32	.35
Borderline	.49	**.61**	**.77**	.28	.40	**.50**
Narcissistic	.29	-.04	.04	.41	.23	.23
Obsessive-compulsive	.30	**.50**	**.54**	.26	**.51**	.45
Schizotypal	.44	.39	.53	.34	.46	**.67**

Abbreviations. Underlined correlations are of moderate effect sizes; bolded correlations are of large effect sizes; ASPD: Antisocial Personality Disorder; APD: Avoidant Personality Disorder; BPD: Borderline Personality Disorder; NPD: Narcissistic Personality Disorder; STPD: Schizotypal Personality Disorder; EID: Internalizing Dysfunction; THD: Thought Dysfunction; BXD: 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.

With this regard, the individuals with the traits such as grandiosity and attention seeking would be labeled as unusual by Iranian people in which the attributes such as modesty, benevolence, and selfless are highly valued. For OCPD, a range of hypothesized scales, which generally included MMPI-2-RF Internalizing scales, appeared as significant predictors. Surprisingly, a series of MMPI-2-RF thought problems scales were incrementally predictive of traits of DSM-5 Section III OCPD, as well. Similar to grandiosity, rigid perfectionism and exclusion of friendships and leisure because of overworking are not particularly preferred in the collectivist culture of Iranians, and thus, could all result in increasing elevations on thought problems scales. We should also note that these results were contrary to studies in which DSM-5 Section II OCPD was assessed through MMPI-2-RF scales [14,21]. An explanation for the differences in outputs could be a fundamental difference between DSM-5 Section II and Section III in the conceptualization of OCPD. According to meta-analytic research [5,22], the empirical support for predicting role of PID-5 Intimacy Avoidance and Restricted Affectivity facets on DSM-5 Section II OCPD were not found. Hence, a closer examination requires the presentation of pathological traits consistent with this PD.

For schizotypal PD, a series of hypothesized and non-hypothesized scales emerged as significant predictors. The results may be due to the heterogeneous nature of schizotypal personality traits; schizotypal PD traits are clustered into PID-5 Psychoticism (Eccentricity, Perceptual Dysregulation, and Unusual Beliefs & Experiences) and Detachment (Suspiciousness, Restricted Affectivity, and Withdrawal) domains [3], which could result in the wide range of MMPI-2-RF associations with thought and internalizing nature. Of note, some of predictors referred to externalizing problems, albeit with a smaller effect size. We should note that among the meaningful predictors, a set of thought problems scales had considerable elevations, reflecting the core features of this PD. In terms of antisocial PD, a range of MMPI-2-RF externalizing, thought, and internalizing scales were significant predictors of this PD, though MMPI-2-RF scales with an externalizing nature had the largest correlations with traits of DSM-5 Section III antisocial PD. Likewise, Borderline PD was predicted by the majority of hypothesized MMPI-2-RF scales, located in all three general structures of psychopathology (internalizing, thought, and externalizing dysfunctions), with internalizing scales contributing the largest amount of variance. Based on the viewpoint of some theoreticians such as Kernberg [23], all three of antisocial, borderline, and schizotypal PDs are considered as more severe mental disorders, accompanied by a large number of psychological problems, compared to less severe PD (i.e., OCPD) [24]. Hence, the presence of a diverse number of predictive scales could be due a very high severity of these PDs. It should be underlined that

TABLE III. *Hierarchical regression analyses predicting DSM-5 Section III PDs using MMPI-2-RF scales.*

p	Beta	p	Adjusted R^2	Variables entered	Steps
					Antisocial PD
					HO scales
		p < .001	.41		1
p < .001	.54			BXD	
		p < .001	.47		2
p < .001	.19			EID	
p < .001	.15			THD	
					RC scales
		p < .001	.46		1
p < .001	.38			RC9	
p < .001	.30			RC4	
.613	.02			RC3	
		p < .001	.48		2
p < .001	.19			RCd	
					SP scales
		p < .001	.37		1
p < .001	-.20			IPP	
p < .001	.20			JCP	
p < .001	.13			SUB	
.003	.13			ANP	
.003	.12			AGG	
		p < .001	.43		2
p < .001	.21			COG	
.028	.09			FML	
.035	.08			ACT	
					PSY-5 scales
		p < .001	.39		1
p < .001	.45			DISC-r	
p < .001	.17			AGGR-r	
		p < .001	.46		2
p < .001	.21			NEGE-r	
.005	.11			PSYC-r	
					Avoidant PD
					HO scales
		p < .001	.51		1
p < .001	.72			EID	
					RC scales
		p < .001	.54		1
p < .001	.34			RC2	

TABLE III. *continue*

p	Beta	p	Adjusted R^2	Variables entered	Steps
p < .001	.26			RCd	
p < .001	.21			RC7	
		p < .001	.57		2
p < .001	.19			RC3	
					SP scales
		p < .001	.59		1
p < .001	.23			SAV	
p < .001	.19			DSF	
p < .001	.15			STW	
p < .001	.13			NFC	
p < .001	.12			AXY	
p < .001	.12			MLS	
.006	.10			SHY	
.416	.03			SFD	
		.002	.61		2
p < .001	.12			HLP	
.003	.09			SUI	
					PSY-5 scales
		p < .001	.47		1
p < .001	.48			NEGE-r	
p < .001	.43			INTR-r	
		p < .001	.50		2
p < .001	.19			PSYC-r	
					Borderline PD
					HO scales
		p < .001	.62		1
p < .001	.58			EID	
p < .001	.29			BXD	
p < .001	.17			THD	
					RC scales
		p < .001	.64		1
p < .001	.50			RCd	
p < .001	.21			RC9	
p < .001	.12			RC4	
.029	.10			RC7	
No significant predictor					
					SP scales
		p < .001	.62		1
p < .001	.16			SFD	
p < .001	.16			ANP	

TABLE III. *continue*

p	Beta	p	Adjusted R^2	Variables entered	Steps
p < .001	.14			SUI	
p < .001	.13			COG	
.002	.13			STW	
.008	.09			AGG	
.005	.10			HLP	
.021	.08			FML	
.372	.03			AXY	
		.018	.63		2
p < .001	.12			ACT	
					PSY-5 scales
		p < .001	.53		1
p < .001	.56			NEGE-r	
p < .001	.25			DISC-r	
p < .001	.13			PSYC-r	
					Narcissistic PD
					HO scales
		p < .001	.13		1
p < .001	.25			BXD	
		p < .001	.19		2
p < .001	.28			THD	
					RC scales
		p < .001	.25		1
p < .001	.37			RC9	
		.002	.27		2
.010	.12			RC6	
					SP scales
		p < .001	.18		1
p < .001	.30			ACT	
p < .001	-.24			IPP	
					PSY-5 scales
		p < .001	.13		1
p < .001	.21			AGGR-r	
		p < .001	.22		2
p < .001	.25			PSYC-r	
p < .001	.16			DISC-r	
					OCPD
					HO scales
		p < .001	.14		1
p < .001	.28			EID	
		p < .001	.24		2
p < .001	.33			THD	

TABLE III. *continue*

p	Beta	p	Adjusted R^2	Variables entered	Steps
					RC scales
		p < .001	.23		1
.019	.15			RC7	
.025	.13			RCd	
		p < .001	.30		2
p < .001	.19			RC8	
p < .001	.16			RC3	
.047	.09			RC6	
					SP scales
		p < .001	.27		1
p < .001	.27			DSF	
p < .001	.17			NFC	
.015	.11			STW	
		.082	.28		2
.011	.11			FML	
					PSY-5 scales
		p < .001	.15		1
p < .001	.23			NEGE-r	
		p < .001	.23		2
p < .001	.33			PSYC-r	
					Schizotypal PD
					HO scales
		p < .001	.43		1
p < .001	.46			THD	
p < .001	.23			EID	
		p < .001	.46		2
p < .001	.20			BXD	
					RC scales
		p < .001	.50		1
p < .001	.36			RC8	
p < .001	.21			RCd	
p < .001	.18			RC6	
		.003	.52		2
p < .001	.15			RC3	
.034	.07			RC4	
					SP scales
		p < .001	.30		1
p < .001	.23			DSF	
p < .001	.16			COG	
.231	.05			NUC	
		p < .001	.41		2

TABLE III. *continue*

p	Beta	p	Adjusted R^2	Variables entered	Steps
p < .001	.25			ACT	
p < .001	.14			SHY	
.003	.12			SUI	
.006	.12			FML	
					PSY-5 scales
		p < .001	.41		1
p < .001	.50			PSYC-r	
p < .001	.13			NEGE-r	
		p < .001	.46		2
p < .001	.24			DISC-r	

Abbreviations. EID: Internalizing Dysfunction; THD: Thought Dysfunction; BXD: Externalizing Dysfunction; RCd: Demoralization; 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; 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; 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.

these severe PDs could be differentiated from each other based on diminished and elevated levels across MMPI-2-RF scales; for instance, as noted earlier, schizotypal PD showed the strongest associations with MMPI-2-RF thought dysfunction scales, whereas borderline and antisocial PDs had their highest correlations with a set of internalizing and externalizing scales, respectively.

As with all studies, this study is not without limitations. The most notable limitation is that we only focused on Criterion B of APMD for assessment of DSM-5 Section III PDs, and did not examine functional impairments, which were known as Criterion A. Thus, for more comprehensive analysis, the functional impairments should be examined in future research. Another limitation was that we used a non-clinical sample, which it would some way restrict generalization of the findings to a clinical setting. In the light of these limitations, our work adds to a growing literature showing the predicting role of MMPI-2-RF scales in Criterion B of DSM-5 Section III PDs in this Middle-East sample. The results could support the potential utility of MMPI-2-RF in measuring DSM-5 Section III PDs.

Conflict of interest statement

The Authors declare no conflict of interest.

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Authors' contributions

Conceptualization Ideas: JLA
Methodology: JLA, ZGF
Software: ZGF
Validation: ZGF
Formal analysis: ZGF, JLA
Investigation: ZGF, JLA, AP
Writing-original draft: ZGF
Writing-review & editing: JLA
Supervision: ZGF, AM, SS
Project administration: ZGF

Ethical consideration

The University of Social Welfare and Rehabilitation Sciences in Tehran, Iran, approved the research, with the approval number of IR.USWR.REC.1396.320.

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.

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