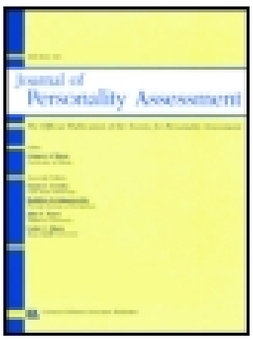

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External Correlates of the MMPI-2-Restructured Form across a National Sample of Veterans

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ABSTRACT

This study examines the convergent validity of the substantive scales of the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF) in the Veteran Affairs (VA) population. The sample includes test protocols drawn from all administrations of the MMPI-2-RF or MMPI-2 entered into the electronic medical record system between January 1, 2008 and May 31, 2015 at any VA across the United States. After excluding invalid protocols, substantive scale scores were correlated with external measures of depression, anxiety, and posttraumatic stress disorder if they were administered within |14| days of the MMPI-2/-RF. Results supported the convergent validity of the MMPI-2-RF emotional dysfunction domain scores. Discriminant validity for the remaining MMPI-2-RF substantive scale scores was also adequate. Limitations and implications of these findings are discussed.

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The mental health needs of Veterans are substantially greater than that of the general population (Seal, Bertenthal, Maguen, Gima, Chu, & Marmar, 2008), and an increasingly large portion of Veterans are receiving care at the Veteran Affairs (VA) for these needs (Kang, 2008). Estimates suggest that approximately 9 million Veterans are enrolled in health care programs across 1,250 different nation-wide VA healthcare facilities (Department of Veteran Affairs, 2018). Moreover, almost half of all Veterans utilize one or more services offered by the VA each year (National Center for Veterans Analysis and Statistics, 2016) with nearly a quarter of veterans linked to the VA because of injuries associated with their service (Bagalman, 2014). However, only a minority of Veterans who need mental health services obtain them within a year of being first diagnosed (Seal et al., 2010). In conjunction with the substantial rate and severity of mental health needs among Veterans, these utilization trends underscore that VA services are critical to promoting good mental and physical health among Veterans.

Effective screening and psychological evaluation is a critical part of providing Veterans with needed health care services (Seal et al., 2008). In general, Veterans receiving healthcare services from the VA have more complicated clinical presentations as well as more frequent and more severe levels of physical problems (Hoerster et al., 2012; Teachman, 2011) and mental health symptoms (Agha, Lofgren, VanRuiswyk, & Layde, 2000; Hankin, Spiro, Miller, & Kazis, 1999; Hoge, Auchterlonie, & Milliken, 2006; Kaplan, Huguet, McFarland, & Newsom, 2007; Kilpatrick et al., 2013; Kazis et al., 1998) than both civilians and Veterans not receiving healthcare services at the VA. Accordingly, these challenging diagnostic presentations complicate treatment referral, planning and provision (Hoge & Warner, 2014; Kang, Natelson, Mahan, Lee, and Murphy, 2003). Broadband personality measures offer a means to comprehensively assess many psychological concerns as well as test-taker response styles that are relevant to the compensation evaluation process (DeViva & Bloem, 2003; Freeman, Powell, & Kimbrell, 2008; Ray, 2017).

One broadband instrument applicable to psychological evaluations at the VA is the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008/2011). Past research support that the validity scales of the MMPI-2-RF reliably detect patterns of invalid responding in Veteran populations (Goodwin, Selbom, & Arbisi, 2013; Nelson et al., 2011; Sellbom, Wygant, & Bagby, 2012; Shura, Denning, Miskey, & Rowland, 2017). The MMPI-2-RF also has 40 substantive scales which assess a variety of psychological problems including common diagnostic presentations and clinical concerns in the VA. Exemplifying this utility, the substantive scales have demonstrated their efficacy in the Veteran public health concerns of posttraumatic stress disorder (PTSD) and suicidality (e.g., Gottfried, Bodell, Carbonell, & Joiner, 2014; Koffel, Polusny, Arbisi, & Erbes, 2012; Sellbom et al., 2012, 2011; Wolf et al., 2008). The substantive scales are also effective predictors of treatment engagement and outcome (Anestis, Finn, Gottfried, Arbisi, & Joiner, 2015; Arbisi, Rusch, Polusny, Thuras, & Erbes, 2013; Forbey, Ben-Porath, Arbisi, 2012).

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Two recent studies have utilized the current dataset to provide up to date MMPI-2-RF descriptive information. Examining the MMPI-2-RF validity scales, Ingram, Tarescavage, Ben-Porath, and Oehlert (2019a) found that over-reporting was the most frequent type of response invalidity, that response styles varied by evaluation setting, and that the most conservative validity scale cut-scores in the Administration and Scoring Manual (Ben-Porath & Tellegen, 2008/2011) were most appropriate for use within the VA. In an examination of the substantive scales, Ingram, Tarescavage, Ben-Porath, and Oehlert (2019b) found that differences in scale elevations were associated with commonly expected clinical concerns across four treatment settings (medical, polytrauma, PTSD clinic, and substance abuse treatment). For instance, somatic and neurological were most pronounced within the medical sample, avoidant behaviors and trauma-linked symptoms were greatest in the PTSD clinic, and substance use and disinhibited externalizing conduct were highest amongst individuals undergoing substance use treatment.

Although these studies offer descriptive frameworks for understanding common VA response patterns on the MMPI-2-RF, research is needed on the association between the MMPI-2-RF substantive scales and extra-test measures to ensure the scale's validity within the VA. The external correlates for VA samples in the MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011) are demographically distinct from those currently receiving care, under-representing Gulf War Veterans and women (Bagalman, 2014; DeViva & Bloem, 2003; Freeman et al., 2008). As such, the purpose of this study is to provide a contemporary examination of convergent validity associations between some commonly used self-report symptom inventories and the substantive scales scores of the MMPI-2-RF. In this study, we report correlations between the MMPI-2-RF substantive scales and several patient-reported symptom inventories commonly used within the VA. Relationships between these frequently utilized measures and the MMPI-2-RF builds upon the foundational validity data of the technical manual (Tellegen & Ben-Porath, 2008/2011) by providing up-to-date criterion relationships with patient care measures widely utilized within the VA. These self-report inventories assessed the symptoms of depression, anxiety, and PTSD. We expected moderate to strong convergent associations between scale scores in the MMPI-2-RF emotional dysfunction domain and these self-report clinical indicators. In terms of discriminant validity, we expected scores from the other MMPI-2-RF substantive domains would generally have negligible to moderate associations with the criteria.

Method

Participants

Participants were considered for inclusion within this study if testing data for either the MMPI-2 or the MMPI-2-RF and at least one self-report inventory was entered electronically into the VA Mental Health Assistant Suite. All administrations must have occurred between January 1, 2008 and May 31, 2015. Participants from all VAs across the country were considered, so long as their data were accessible via the electronic medical database stored within the Corporate Data Warehouse (CDW). In cases where there were multiple MMPI-2/MMPI-2-RF administrations recorded within the system; the first administration was utilized. In cases where a single participant had multiple administrations of a criterion measure, the most proximal administration (to the included MMPI-2/MMPI-2-RF administration) was retained. Individuals with invalid MMPI-2-RF protocols were excluded using standard validity scale cut-scores as recommended in the MMPI-2-RF Administration and Interpretation Manual (Ben-Porath & Tellegen, 2008/2011) and by the results of Ingram and colleagues (2019a) VA study (VRIN-r $\geq$ 80, TRIN-r $\geq$ 80, F-r = 120, Fp-r $\geq$ 100, Fs $\geq$ 100, RBS $\geq$ 100, FBS-r $\geq$ 100, L-r $\geq$ 80, and K-r $\geq$ 70). No participants were excluded on CNS. For a detailed description of validity scale performance within this VA database, see Ingram and colleagues (2019a).

This study's sample (n = 14,956) is an average of 45.1 years old (SD = 14.9). Participants tend to be male (85.3%), married (48.1%), were service connected for injuries incurred during their service (82.2%), and did not have combat experience as part of their service (85.4%; percentage calculated based on those with information available on combat exposure in their medical charts such that those with missing data are excluded). Most Veterans within the sample had their military service associated with the Gulf War (58.9%). The largest portion of participants (59.6%) were administered the MMPI-2-RF within VA service clinics associated with a form of mental health care as a primary service (e.g., stop code 502 [Mental Health Clinic] n = 2,395, Stop code 510 [Psychology, Individual] n = 1,001, Stop Code 512 [Mental Health Consultation] n = 910, and Stop Code 538 [Psychosocial Rehabilitation] n = 4,608) and medical care was the second most frequent (e.g., stop code 301 [Internal Medicine] n = 702 and stop code 323 [Primary Care] n = 489). For extended demographic information on the sample, see Table 1.

Measures

MMPI-2-restructured form

The MMPI-2-RF (Ben-Porath & Tellegen, 2008/2011) is a 338 true-false item personality measure comprised of 51 scales. The 42 substantive scales measure various clinical constructs and the nine validity scales are used to determine if a respondent is engaging in non-credible responding (non-content based invalid responding, over-reporting, under-reporting). Two of these substantive scales measure non-clinical vocational interests. The over-reporting scales have large effect sizes but have also demonstrated moderation for issues critical to Veterans, such as PTSD, traumatic brain injury, and so forth (Ingram & Ternes, 2016). In the current study, MMPI-2 protocols were used to calculate MMPI-2-RF scores. Tarescavage, Alosco, Ben-Porath, Wood, and Luna-Jones (2015) found that MMPI-2-RF scores from the MMPI-2 and MMPI-2-RF booklets were equivalent.

External self-report symptom measures

Several widely used and psychometrically validated self-report inventories were selected to provide a comprehensive evaluation of common clinical concerns related to depression, anxiety, and PTSD. These self-report inventories were selected based on their availability within the medical record system, their popularity in use, and the research base supporting their validity and clinical utility. Depression was measured on the Patient Health Questionaire-2 (PHQ-2; Kroenke, Spitzer, & Williams, 2003) and the Beck Depression Inventory-2 (BDI-2; Beck, Seer, & Grown, 1996). Two self-report inventories assessed anxiety: the Beck Anxiety Index (BAI; Beck & Steer, 1990) and the General Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006). PTSD was assessed using both civilian and military versions of the PTSD Checklist (PCL-C and PCL-M, respectively; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), the Primary Care-PTSD checklist (PC-PTSD; Prins et al., 2004), the Mississippi Combat PTSD checklist (MISS; Keane, Caddell, & Taylor, 1988), and the PTSD Checklist for DSM-5 (PCL-5; Blevins, Weathers, Davis, Witte, & Domino, 2015). A brief summary of the criterion measures utilized within this study is provided in Table 2.

Table 1. Demographic characteristics.

	Full sample $n = 14{,}956$
Marital status	
Single	2,916 (19.5%)
Separated	609 (4.1%)
Married	7,187 (48.1%)
Divorced	3,669 (24.5%)
Widowed	260 (1.7%)
Missing	315 (2.1%)
Period of service	
World War II	19 (0.1%)
Korea	56 (0.4%)
Post-Korean	36 (0.2%)
Vietnam-Era	4,335 (20.0%)
Post-Vietnam	1505 (10.1%)
Gulf War	8,803 (58.9%)
Other/Missing	202 (1.4%)
Frequent stop codes (n > 200)	
Psychosocial Rehabilitation (538)	4,608 (30.8%)
Mental Health Clinic (502)	2,395 (16.0%)
Psychology, Individual (510)	1,001 (6.7%)
Mental Health Consultation (512)	910 (6.1%)
Internal Medicine (301)	702 (4.7%)
PTSD Clinical Team (540)	523 (3.5%)
Primary Care (323)	489 (3.3%)
Administrative Activities (674)	304 (2.0%)
Mental Health Biomedical Care (533)	215 (1.4%)
Service Connection	
NSC	2,197 (17.2%)
0%	219 (1.7%)
10–30%	1,694 (13.3%)
31–50%	1,671 (13.1%)
51–70%	3,216 (25.2%)
71–99%	3,395 (26.6%)
100%	2,564 (20.1%)
%Male	12,759 (85.3%)
Combat Veteran	
Yes	1,679 (11.2%)
No	9,810 (65.6%)
Missing	3,467 (23.2%)

Note. NSC = Non-Service Connected. This indicates that an individual was either not evaluated for service connection or that their evaluation indicated the presenting problem was not related to their military service. Information of education level is not coded within the electronic medical record and, thus, was not available for demographic information.

Procedures

The CDW electronically stores Veteran medical records from the entire United States. Data was extracted through VA Informatics and Computing Infrastructure (VINCI). A request to the CDW was made based on testing administrations that were coded as including either a MMPI-2 or MMPI-2-RF between January 1st, 2008 until May 31, 2015 at any VA in the United States. This study extracted demographic information as well as item-level responses for all identified MMPI-2 or MMPI-2-RF administrations between January 1st, 2008 until May 31, 2015. Raw item responses were used to calculate MMPI-2-RF scale scores. Total scale scores (and not individual item responses) were extracted for self-report inventories. We used self-report test administrations from within a 14-day window of a MMPI-2 or MMPI-2-RF administration in any VA service clinic.

We calculated zero-order correlations between MMPI-2-RF scores and the external self-report criteria. Correlation coefficients were interpreted as small ($.3 > r > .1$), medium ($.5 > r \geq .3$), and large ($.5 \geq r$) effects (Cohen, 1988). Family-wise Bonferroni corrected correlations were utilized for statistical significance (e.g., .05/3 for the H-O scales; .05/9 for the RC scales, .05/5 for the Somatic/Cognitive scales, .05/9 for the Internalizing scales, .05/4 for the Externalizing Scales, .05/5 for the Interpersonal scales, and .05/5 for the PSY-5 scales). We interpreted statistically significant correlations of a medium to strong effect size ($r >= |.40|$) as clinically meaningful due to shared method variance.

Table 2. Summary of the criterion measures utilized within this study.

Abbreviation	Name	# Items	Content assessed
Depression			
PHQ-2	Patient Health Questionaire-2	2	Depression measure assessing anhedonia and depressed mood in the past two weeks
BDI-2	Beck Depression Inventory-2	21	Depression severity over the past two weeks
Anxiety			
GAD-7	Generalized Anxiety Disorder 7-item	7	Generalized anxiety symptoms in the past two weeks
BAI	Beck Anxiety Index	21	Common symptoms of anxiety during the past week
PTSD			
PCL-5	PTSD checklist for DSM-5	20	DSM-V symptoms of PTSD, including a calculation of disorder specific cluster scores
MISS	Mississippi Combat PTSD Checklist	35	DSM-IV symptoms of PTSD for combat-related traumatic experiences
PC-PTSD	Primary Care PTSD Checklist	4	DSM-IV symptoms of PTSD for an situation that was "frightening, horrible, or upsetting"
PCL-M	PTSD Checklist-Military	17	DSM-IV symptoms of PTSD, in response to "stressful military experiences"
PCL-C	PTSD Checklist-Civilian	17	DSM-IV symptoms of PTSD, in response to "stressful experiences"

Table 3. Extra-test correlations for the internalizing and thought dysfunction domains of the MMPI-2-RF.

	Depression		Anxiety		Posttraumatic Stress Disorder PCL-5										
MMPI-2-RF Scale	PHQ-2	BDI-2	GAD-7	BAI	Total Score	Cluster B	Cluster C	Cluster D	Cluster E	MISS	PC-PTSD	PCL-C	PCL-M	M	SD
Internalization															
EID	.23*	**.74***	**.46***	**.40***	.28*	.21*	.22*	.36*	.21*	**.65***	.35*	**.51***	**.53***	65.4	12.4
RCd	.24*	**.74***	**.42***	.39*	.30*	.23*	.21*	**.41***	.24*	**.62***	.34*	**.50***	**.51***	65.4	12.4
SUI	.24*	.39*	.18	.23*	.11*	.10*	.07	.12*	.08	.36*	.12*	.23*	.24*	56.6	16.5
HLP	.20*	**.54***	.17	.28*	.16*	.11*	.09	.26*	.10	**.43***	.19*	.33*	.32*	59.8	14.8
SFD	.17*	**.59***	.31*	.29*	.21*	.14*	.12*	.32*	.18*	**.42***	.22*	.34*	.35*	59.5	12.4
SUI	.24*	.39*	.18	.23*	.11*	.10*	.07	.12*	.08	.36*	.12*	.23*	.24*	56.6	16.5
RC2	.19*	**.65***	.37*	.33*	.24*	.18*	.20*	.29*	.10*	**.56***	.30*	**.41***	**.44***	67.2	15.4
RC7	.17*	**.58***	**.48***	.37*	.26*	.24*	.23*	.32*	.26*	**.59***	**.41***	**.48***	**.47***	61.3	13.2
STW	.13*	**.51***	.38*	.33*	.17*	.15*	.11*	.23*	.18*	**.42***	.30*	.36*	.34*	59.1	12.1
AXY	.14*	**.56***	**.61***	**.41***	.31*	.34*	.30*	.31*	.29*	**.60***	**.51***	**.58***	**.57***	71.2	17.4
ANP	.13*	**.43***	**.41***	.25*	.25*	.17*	.20*	.25*	.33*	**.49***	.32*	.37*	.38*	60.9	13.1
BRF	.06	.32*	.26*	.26*	.21*	.19*	.16*	.23*	.16*	.36*	.26*	.31*	.30*	56.5	12.6
MSF	.05	.10*	.04	.12*	.04	.08	.06	.04	.06	.12*	.02	.12*	.09*	47.9	8.5
NEGE-r	.15*	**.59***	**.47***	.39*	.25*	.22*	.21*	.30*	.30*	**.57***	.38*	**.47***	**.46***	62.5	13.3
INTR-r	.15*	**.53***	.31*	.24*	.19*	.15*	.16*	.23*	.04	**.52***	.28*	.37*	**.40***	65.9	14.8
Thought Dysfunction															
THD	.05	.33*	.18	.27*	.20*	.21*	.10	.20*	.19*	.36*	.25*	.30*	.29*	58.5	12.5
RC6	.12*	.33*	.15	.22*	.19*	.12*	.08	.23*	.17*	.31*	.19*	.26*	.21*	60.0	13.0
RC8	.09	.36*	.22*	.29*	.22*	.24*	.15*	.21*	.22*	**.42***	.31*	.35*	.35*	60.8	12.6
PSYC-r	.08	.35*	.21*	.28*	.20*	.22*	.11*	.21*	.21*	.36*	.24*	.29*	.29*	58.0	12.2
M	1.4	24.0	11.6	15.1	49.8	12.5	5.6	16.3	15.0	107.7	1.9	56.0	56.9		
SD	1.9	12.5	5.8	13.2	15.7	4.6	2.2	6.5	5.0	21.7	1.7	14.5	14.2		
N	275	8,434	89	4,995	547	547	547	547	547	3,067	2,444	3,228	2,812		

Note. *$p < .05$. Underlined values meet Bonferroni correction values. Bolded values $r \geq |.40|$. EID = Emotional/Internalizing Dysfunction, RCd = Demoralization, SUI = Suicidal/Death Ideation, HLP = Helplessness/Hopelessness, SFD = Self-Doubt, NFC = Inefficacy, RC2 = Low Positive Emotions, RC7 = Dysfunctional Negative Emotions, STW = Stress/Worry, AXY = Anxiety, ANP = Anger Proneness, BRF = Behavior Restricted Fear, MSF = Multiple Specific Fears, NEGE-r = Negative Emotionality/Neuroticism-revised, INTR-r = Introversion/Low Positive Emotionality, THD = Thought Dysfunction, RC6 = Ideas of Persecution, RC8 = Aberrant Experiences, PSYC-r = Psychoticism-revised, PHQ-2 = Patient Health Questionaire-2, BDI-2 = Beck Depression Inventory-2, GAD-7 = General Anxiety Disorder-7, BAI = Beck Anxiety Index, PCL-5 = PTSD Checklist for DSM-5, Cluster B = DSM-5 PTSD intrusive or reeexperiencing symptoms, Cluster C = DSM-5 PTSD Avoidance symptoms, Cluster D = DSM-5 PTSD Negative alterations in mood or cognition symptoms, Cluster E = DSM-5 PTSD increased arousal symptoms, MISS = Mississippi Combat PTSD Checklist, PC-PTSD = Primary Care-PTSD Checklist, PCL-C = PTSD Checklist-Civilian, PCL-M = PTSD Checklist-Military.

Results

To facilitate interpretation of these findings, they are summarized in reference to each of the five MMPI-2-RF domains, which include: (1) Internalization (2) Thought Dysfunction; (3) Externalization (4) Somatic/Cognitive Complaints; and (5) Interpersonal Functioning. Zero-order correlations and descriptives for the internalizing and thought dysfunction substantive scales of the MMPI-2-RF are presented in Table 3, and results for scales measuring externalizing, interpersonal, and somatic/cognitive problems are presented in Table 4. Additionally, observed means for the MMPI-2-RF scales and the criteria are listed in these tables.

The scales in the internalization domain include Higher-Order Scale Emotional/Internalizing Dysfunction (EID) and Restructured Clinical Scales Demoralization (RCd), Low Positive Emotions (RC2), and Dysfunctional Negative Emotions (RC7). This domain also includes the Internalizing Specific Problem Scales Suicidal/Death Ideation (SUI), Helplessness/Hopelessness (HLP), Self-Doubt (SFD), Inefficacy (NFC), Stress/Worry (STW), Anxiety (AXY), Anger Proneness (ANP), Behavior-Restricting Fears (BRF), and Multiple Specific Fears (MSF). Finally, this domain includes Personality-Psychopathology-5 Scales Negative Emotionality/Neuroticism-Revised (NEGE-r) and Low Positive Emotionality/Introversion-Revised (INTR-r). As presented in Tables 2 and 3, several scales demonstrated convergent associations with the BDI-2, including EID, RCd, RC2, RC7, HLP, SFD, NFC, STW, AXY, ANP, NEGE-r, and INTR-r. The anxiety-related criteria were meaningfully correlated with EID, RCd, RC7, AXY, ANP, and NEGE-r. The military and civilian versions of the PCL were meaningfully associated with EID, RCd, RC2, RC7, AXY, and NEGE-r. The PC-PTSD was moderately correlated with RC7 and AXY. The MISS PTSD measure was meaningfully associated with several MMPI-2-RF internalizing measures, including EID, RCd, RC2, RC7, HLP, SFD, STW, AXY, ANP, NEGE-r, and INTR-r. In general, the AXY scale had the strongest associations with PTSD criteria.

The scales in the Thought Dysfunction domain include Higher-Order Scale Thought Dysfunction (THD), Restructured Clinical Scales Persecutory Ideation (RC6) and Aberrant Experiences (RC8), and Personality-Psychopathology-5 Scale Psychoticism-Revised (PSYC-r). Only RC8 was meaningfully correlated with the criteria (MISS PTSD measure). The scales in the Behavioral Dysfunction domain include Higher-Order Scale Behavioral/Externalizing Dysfunction (BXD), Restructured Clinical Scales Antisocial Behavior (RC4) and Hypomanic Activation (RC9), and the Externalizing Specific Problem Scales Juvenile Conduct Problems (JCP), Substance Abuse (SUB), Aggression (AGG), and Activation (ACT). This domain also includes Personality-Psychopathology-5 Scales Aggressiveness-Revised (AGGR-r) and Disconstraint-Revised (DISC-r). Here too, only one scale was meaningfully correlated with the criteria: AGG with MISS.

The scales in the Somatic/Cognitive Complaints domain include Restructured Clinical Scale Somatic Complaints

Table 4. Extra-test correlations for Externalizing, Somatic/Cognitive, and Interpersonal domains of the MMPI-2-RF.

	Depression		Anxiety		Posttraumatic Stress Disorder PCL-5										
MMPI-2-RF Scale	PHQ-2	BDI-2	GAD-7	BAI	Total Score	Cluster B	Cluster C	Cluster D	Cluster E	MISS	PC-PTSD	PCL-C	PCL-M	M	SD
Externalizing															
BXD	.09	.12*	.11	.08*	.06	−.02	.08	.11*	.18*	.24*	.15*	.11*	.07*	55.4	11.1
RC4	.11	.18*	.05	.11*	.05	−.02	.06	.11*	.12*	.28*	.16*	.12*	.12*	57.1	11.3
JCP	.06	.04*	−.05	.03*	−.05	−.10*	−.01	.01	.01	.09*	.04*	.01	.01	55.2	12.5
SUB	.01	.13*	.02	.06*	.08	.04	.07	.11*	.16*	.23*	.12*	.10*	.07*	54.4	12.3
RC9	.05	.11*	.22*	.10*	.15*	.09*	.11*	.18*	.27*	.17*	.16*	.10*	.06*	51.8	10.4
AGG	.08	.34*	.31*	.22*	.18*	.10*	.17*	.20*	.28*	**.46***	.32*	.30*	.27*	57.2	12.8
ACT	.04	.08*	.10	.12*	.10*	.12*	.10*	.14*	.17*	.09*	.12*	.09	.06*	50.0	11.2
AGGR-r	.03	−.02*	.09	.02	.10*	.07	.09	.07	.17*	.12*	.12*	.07*	.02	54.4	11.7
DISC-r	.07	−.02	−.02	−.02	.01	−.06	.02	.08	.14*	.04*	.07*	−.01	−.07*	54.9	10.4
Somatic/Cognitive															
RC1	.08	**.50***	.37*	**.44***	.24*	.28*	.20*	.28*	.20*	**.43***	.29*	**.43***	**.43***	70.1	13.6
MLS	.14*	**.57***	.16	.37*	.21*	.21*	.19*	.21*	.11*	**.48***	.27*	**.43***	**.43***	71.2	12.4
GIC	.12	**.42***	.25*	.35*	.12*	.17*	.12*	.13*	.06	.35*	.24*	.37*	.36*	63.7	16.3
HPC	.02	.39*	.39*	.33*	.21*	.23*	.16*	.22*	.12*	.30*	.27*	.33*	.32*	64.1	12.5
NUC	.01	.36*	.21*	.36*	.19*	.22*	.13*	.23*	.19*	.35*	.21*	.32*	.31*	69.1	14.4
Interpersonal															
FML	.08	.33*	.23*	.19*	.11*	.08	.06	.12*	.06	.32*	.22*	.23*	.24*	54.5	11.7
IPP	.02	.14*	−.01	.05*	−.06	−.06	−.07	.00	−.12*	.07*	−.01	.03	.07*	48.6	10.1
SAV	.13*	.44*	.31*	.21*	.18*	.12*	.19*	.23*	.08	**.51***	.30*	.36*	.38*	64.1	13.3
SHY	.10	.31*	.20	.15*	.07	.02	.03	.07	.02	.24*	.15*	.15*	.18*	52.8	10.6
DSF	.11	.40*	.28*	.19*	.16*	.10*	.12*	.20*	.06	**.48***	.25*	.35*	.37*	64.0	17.0
M	1.4	24.0	11.6	15.1	49.8	12.5	5.6	16.3	15.0	107.7	1.9	56.0	56.9		
SD	1.9	12.5	5.8	13.2	15.7	4.6	2.2	6.5	5.0	21.7	1.7	14.5	14.2		
N	275	8,434	89	4,995	547	547	547	547	547	3,067	2,444	3,228	2,812		

Note. *$p < .05$. Underlined values meet Bonferroni correction values. Bolded values $r \geq |.40|$. BXD = Behavioral/Externalizing Dysfunction, RC4 = Antisocial Behavior, JCP = Juvenile Conduct Problems, SUB = Substance Abuse, RC9 = Hypomanic Activation, AGG = Aggression, ACT = Activation, AGGR-r = Aggressiveness-Revised, DISC-r = Disconstraint-revised, RC1 = Somatic Complaints, MLS = Malaise, GIC = Gastrointestinal Complaints, HPC = Head Pain Complaints, NUC = Neurological Complaints, COG = Cognitive Complaints, FML = Family Problems, IPP = Interpersonal Passivity, SAV = Social Avoidance, DSF = Disaffiliativeness, , PHQ-2 = Patient Health Questionaire-2, BDI-2 = Beck Depression Inventory-2, GAD-7 = General Anxiety Disorder-7, BAI = Beck Anxiety Index, PCL-5 = PTSD Checklist for DSM-5, MISS = Mississippi Combat PTSD Checklist, PC-PTSD = Primary Care-PTSD Checklist, PCL-C = PTSD Checklist-Civilian, PCL-M = PTSD Checklist-Military. On the PCL-5, Cluster B = Intrusive Symptoms, Cluster C = Avoidance, Cluster D = Negative alternations in cognitions and mood, Criterion E = Alterations in arousal and reactivity. On the PCL-5, Cluster B = Intrusive Symptoms, Cluster C = Avoidance, Cluster D = Negative alternations in cognitions and mood, Criterion E = Alterations in arousal and reactivity.

(RC1) and the Somatic/Cognitive Specific Problem Scales, which are comprised of Malaise (MLS), Gastrointestinal Complaints (GIC), Head Pain Complaints (HPC), Neurological Complaints (NUC), and Cognitive Complaints (COG). In this case, RC1, MLS, and COG tended to be moderately to strongly correlated with indicators of depression, anxiety, and PTSD. The GIC scale was meaningfully correlated with BDI-2 scores. Scores on HPC and NUC were not meaningfully correlated with any criteria.

The scales in the Interpersonal Functioning domain include Restructured Clinical Scale Cynicism (RC3) and the Interpersonal Specific Problem Scales, which are comprised of Family Problems (FML), Interpersonal Passivity (IPP), Social Avoidance (SAV), Shyness (SHY), and Disaffiliativeness (DSF). The SAV and DSF scales were meaningfully correlated with BDI-2 scores and MISS scores.

Discussion

This study evaluated the convergent validity of MMPI-2-RF scale scores in a large sample drawn from the VA population. In general, we found that convergent associations between emotional dysfunction scale scores and indicators of depression, anxiety, and post-traumatic stress disorder were generally moderate to strong. As expected, discriminant correlations tended to be weaker between these criteria and scores from other MMPI-2-RF substantive domains. These findings generally support the validity of MMPI-2-RF substantive scale scores in the VA setting. Likewise, the patterns and magnitudes of relationships are generally consistent with similar criterion measures available within the technical manual of the MMPI-2-RF (e.g., scores on the BDI and BDI-2 have correlations of .71 and .74, respectively with scores on EID; Tellegen & Ben-Porath, 2008/2011, p. 190). Several aspects of these findings warrant further discussion.

Consistent with expectations, scale scores from the MMPI-2-RF emotional dysfunction domain generally demonstrated moderate to strong associations with associated criteria measures of depression, anxiety, and PTSD. The strongest associations with measures of PTSD symptomatology tended to be with the AXY scale, which in the *MMPI-2-RF Manual for Administration Scoring, and Interpretation* (Ben-Porath & Tellegen, 2008/2011) is the one scale for which PTSD is listed as a specific diagnostic consideration. This finding is consistent with Sellbom, Lee, Ben-Porath, Arbisi, and Gervais (2012), who found in a forensic disability sample that this scale was the best MMPI-2-RF predictor of PTSD reeexperiencing, avoidance, and hyperarousal symptoms. Arbisi, Polusny, Erbes, Thuras, and Reddy (2011) also found AXY scores to be associated with screening positively for PTSD in a sample of National Guard troops who had returned from combat deployment.

Depressogenic symptoms demonstrated similarly moderate to strong relationships on the BDI-2 (particularly on RCd, RC2, RC7). This finding is consistent with research documenting the centrality of RCd and RC2 elevations in those with diagnosed depressive disorders (Lee, Graham, & Arbisi, 2018; McCord & Drerup, 2011; Sellbom, Bagby, et al., 2012), as well as with RC7 in student populations endorsing depression symptoms (McCord & Provost, 2019). For anxiety symptoms, the BAI had frequent significant relationships to a variety of MMPI-2-RF scales. These relationships were generally consistent with the magnitudes observed on the GAD-7. In general, anxiety symptom endorsement demonstrated moderate associations with most of the internalizing scales and, particularly, with RCd, RC2, RC7, STW, and AXY being amongst the highest observed relationships.

Interestingly, scales from the MMPI-2-RF emotional dysfunction domain demonstrated virtually no meaningful associations with the PHQ-2 or the PCL-5. The PHQ-2 has previously demonstrated some unexpected discrepancy in its measurement of anhedonia specific content, which is assessed on RC2 of the MMPI-2-RF (McCord & Provost, 2019). Moreover, given that the PHQ-2 is only a two-item screener, the validity coefficients within this study are likely attenuated by unreliability and raise questions about the utility of this two-item scale. This poor utility is problematic given that the PHQ-2 is recommended for annual screenings of Major Depressive Disorder within primary care settings (Department of Veteran Affairs, 2016). Likewise, it is also used by some VAs to assess risk of suicidality, in conjunction with PHQ-9 item nine (Department of Veteran Affairs, 2019). Reasons for the lack of meaningful associations with the PCL-5 scales are less clear. While relationships between the MMPI-2-RF and the PCL-5 demonstrated generally expected patterns (e.g., strongest relationships with RCd and AXY), these relationships were not clinically meaningful, and the small magnitude relationships for the PCL-5 is distinct from other PTSD criteria measures within this study. On the one hand, the MMPI-2-RF scales have previously demonstrated utility in those undergoing the Clinician Administered Scale for PTSD (Wolf et al., 2008). Past research has also supported the convergent validity of the PCL-5 in a sample of trauma-exposed college students (Blevins et al., 2015) and a voluntary response sample of Veterans (Bovin et al., 2016). On the other hand, MMPI-2-RF internalizing scales demonstrated expected associations with other measures of PTSD symptomatology in this and previously cited studies, suggesting the PCL-5 findings in the current investigation are anomalous. Given that archival PCL-5 scores in the current study ($M = 49.8$, $SD = 15.7$) were meaningfully higher than the two studies just referenced ($M = 15.4$, $SD = 14.7$ and $M = 37.0$, $SD = 21.2$, respectively), additional research on the PCL-5 and its performance relative to the MMPI-2-RF scales in clinical populations is needed.

Correlations between criteria measures and MMPI-2-RF scales in other domains generally supported the discriminant validity of scores from these scales. Specifically, scores from the thought dysfunction, externalizing, and interpersonal problems domains of the test had very few meaningful associations with criterion measures assessing post-traumatic stress disorder, anxiety, and depression. However, scores from the MMPI-2-RF somatic/cognitive domain (particularly RC1, MLS, and COG) tended to have moderate to large associations with BDI-2 scores and BAI scores, as well as scores from PTSD measures (MISS, PCL-C, and PCL-M). Although correlations at these magnitudes were not formally hypothesized, these findings are not surprising. Somatization tends to be comorbid with mood disorders (Löwe et al., 2008) as well as trauma disorders (Andreski, Chilcoat, & Breslau, 1998) and the diagnostic criteria for depression including a variety of somatic and cognitively focused symptoms (American Psychiatric Association, 2013). The PHQ-2 is also intended for use within primary care settings as a brief screening instrument (see Arroll et al., 2010) and Veterans seen in these clinics are likely experiencing the sort of physical health complaints assessed by the somatic/cognitive domain scales (e.g., Spelman, Hunt, Seal, & Burgo-Black, 2012). Interestingly, the GAD-7 demonstrated notably better discriminant validity than the BAI, with significant elevations occurring less frequently for scales with lower conceptual overlap.

Limitations and future directions

This study's implications should be considered within the context of its limitations. First, some information about the criterion measures was unavailable, including reliability estimates and the locations in which Veterans were administered criteria measures. Likewise, the ethnicity of participants and referral reason for their evaluations was not available. Secondly, the criteria used within this study do not comprehensively measure all clinical concerns common and present within Veteran populations. Rather, they focus specifically on three particularly common symptom sets. Research remains needed on extra-test measures of other clinical concerns, particularly related to physical health, thought disordered content, and substance abuse. Along these lines, further research on the psychometrics of the criterion measures in a VA sample is indicated. Thirdly, we were unable to calculate extra-test relationships across different VA service clinic locations because of insufficient sample sizes within the study sampling timeframe (i.e., $|14|$ days). We believe that the way in which these brief self-report measures are often recorded (e.g., directly into client notes rather than using the Mental Health Suite) may have also affected the feasibility of separating this sample into different service clinics. Lastly, information on current diagnoses of participants within this study was not available and, as such, validity estimates are based on general symptom endorsements rather than differences between bona fide diagnostic groups. Future research would benefit from further evaluation of the capacity of the MMPI-2-RF to differentiate various related and comorbid concerns seen within the Veteran population.

Despite these limitations, this study expands the available information on use of, and research with, the MMPI-2-RF within the VA. Specifically, convergent and discriminant

relationships between the MMPI-2-RF substantive scales and the criteria measures were generally of the magnitudes expected and consistent with similar findings with Veteran samples (Tellegen & Ben-Porath, 2008/2011). Likewise, the large size and nationally representative nature of the sample provides a notable strength to this study, as well as the utility of the MMPI-2-RF with Veterans and within the VA healthcare system.

Author note

The views expressed in this article do not reflect those of the Department of Veteran Affairs or of the United States Government.

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