The Utility of MMPI–2–RF Scale Scores in the Differential Diagnosis of Schizophrenia and Major Depressive Disorder

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The Utility of MMPI–2–RF Scale Scores in the Differential Diagnosis of Schizophrenia and Major Depressive Disorder

Tayla T. C. Lee, John R. Graham, and Paul A. Arbisi

Abstract
This study was designed to determine whether scores on selected Minnesota Multiphasic Personality Inventory–2–Restructured Form (MMPI–2–RF) scales could be used to differentiate between individuals diagnosed with schizophrenia (SCZ) and major depressive disorder (MDD). The sample was drawn from 2 psychiatric inpatient hospitals and included data from 199 individuals with SCZ and 808 individuals with MDD. A series of multivariate analyses of variance, analyses of variance, and odds ratios were calculated to determine which MMPI–2–RF scales provide the best differentiation between individuals presenting with these 2 disorders. Results indicated scales assessing internalizing dysfunction, including Emotional/ Internalizing Dysfunction (EID), Restructured Clinical Scales Demoralization (RCd), Low Positive Emotions (RC2), Suicidal/Death Ideation (SUI), and Self Doubt (SFD) best discriminated MDD from SCZ. Scales assessing thought dysfunction, including Thought Dysfunction (THD), Restructured Clinical Scales Ideas of Persecution (RC6) and Aberrant Experiences (RC8), and Psychoticism-Revised (PSYC-r) were demonstrated to best identify SCZ. Comparisons of the examined MMPI–2–RF scales to MMPI–2 scales assessing similar constructs suggested scales from the MMPI–2–RF perform similarly to their MMPI–2 counterparts in detecting MDD or SCZ, but might have increased ability to discriminate SCZ from other conditions. Overall, results of this study suggest that scores on the examined MMPI–2–RF scales provide important information about the differential diagnosis of MDD and SCZ to clinicians working in inpatient settings.

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Due to the time-sensitive nature of diagnostic assessments, clinicians must often make decisions regarding diagnosis based on observation of an individual’s presenting symptoms. Given the difficulty of the differential diagnostic task, clinicians often use psychological instruments to obtain information about the individual that is not readily apparent during initial interviews. There is a large body of previous research examining the ability of scale scores on the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) and Minnesota Multiphasic Personality Inventory–2 (MMPI–2; Butcher et al., 2001) to assist in differential diagnosis of psychotic and depressive disorders, including schizophrenia (SCZ) and major depressive disorder (MDD). For example, Goldberg (1965) and Meehl and Dahlstrom (1960) expended considerable effort to empirically demonstrate the utility of the MMPI in distinguishing psychotic from depressive disorders. With the publication of the MMPI–2, Ben-Porath, Butcher, and Graham (1991) pursued similar efforts, demonstrating that scores on the (then) newly developed Content scales added incrementally to the Clinical scales in the differentiation of individuals with SCZ and MDD. Nonetheless, results of both MMPI and MMPI–2 studies suggested overall that scale scores from these instruments were only modestly successful in assisting clinicians with differentiating between psychotic and depressive mood conditions.

Previous efforts to demonstrate the utility of the MMPI family of instruments in differentiating between SCZ and MDD might have been limited by characteristics of the scales themselves. Although scales of the MMPI were originally developed to differentiate between varying forms of psychopathology (Hathaway & McKinley, 1943), it was quickly recognized that the true strength of these scales was in the empirical correlates that could be established (Hathaway, 1964). As outlined by Tellegen and colleagues (2003), the adoption of the empirical correlates approach to interpretation was due to the fact that many of the scales scored on the MMPI and MMPI–2 are saturated with demoralization, which describes generalized distress experienced during active symptomatic expression of most clinical syndromes (Frank, 1974). Due to this saturation, the task of differential diagnosis using scales scored on these instruments was especially difficult. This idea has been supported in previous research suggesting the scores on many scales (e.g., the Clinical scales) tended to be elevated in persons who were experiencing nonspecific distress and feeling demoralized resulting from the presence of any psychopathological condition rather than one targeted by a particular scale (Sellbom, Ben-Porath, McNulty, Arbisi, & Graham, 2006).
However, scales scored on the newest member of the MMPI family of instruments, the Minnesota Multiphasic Personality Inventory–2–Restructured Form (MMPI–2–RF; Ben-Porath & Tellegen, 2008/2011; Tellegen & Ben-Porath, 2008/2011) could be particularly well-suited for assisting in differential diagnoses. This possibility exists because, beginning with development of the Restructured Clinical scales (RC scales; Tellegen et al., 2003), each of the scales of the MMPI–2–RF was developed to remedy the psychometric and conceptual difficulties encountered when using MMPI and MMPI–2 scales. Indeed, the restructured version of the MMPI–2 was intended to represent the clinically meaningful variance of the MMPI–2 item pool in a concise, yet comprehensive, and psychometrically up-to-date manner (Tellegen & Ben-Porath, 2008/2011). Initial development of the MMPI–2–RF constituted the restructuring of the eight original Clinical scales (Tellegen et al., 2003), which was achieved by identification and extraction of a common general emotional distress dimension and elucidating distinct target constructs from each scale, thereby improving the convergent and discriminant validity of scores on each scale. After the RC scales had been introduced to the MMPI–2, work continued on several other psychometrically efficient scales intended to assess (a) constructs not directly measured by the RC scales, (b) facets of the broader RC scales, or (c) distinctive core components from the original Clinical scales not covered by the RC scales (Tellegen & Ben-Porath, 2008/2011).

The primary feature of the MMPI–2–RF that could potentially enhance the effectiveness of scale scores in differentiating between individuals with SCZ and MDD is the stronger connection between scales scored on this instrument and modern clinical scales (e.g., Tellegen et al., 2003) and are useful in differentiating between disorder classes (Clark, 2005). Previous empirical research has suggested the RC scales demonstrate convergent and discriminant validity comparable to, or better than that demonstrated by the original Clinical scales (e.g., Tellegen et al., 2006) and are useful in differential diagnosis (e.g., Sellbom, Ben-Porath, & Bagby, 2008). Finally, the MMPI–2–RF contains 25 Specific Problem scales and Interest scales, intended to provide a more detailed and nuanced assessment of the constructs assessed higher in the MMPI–2–RF hierarchy (Tellegen & Ben-Porath, 2008/2011). Given their purpose, these scales in particular might be useful in the task of differential diagnosis due to the narrowband measurement they represent, which increases their potential for specificity.

Given the limitations of previous studies examining the utility of MMPI instruments in differentiating between SCZ and MDD, this study was designed to examine the potential contribution of MMPI–2–RF H-O, RC, SP, and Interest scales to the differential diagnosis of SCZ and MDD. To examine the utility of the MMPI–2–RF scales for this purpose, we examined the ability of selected MMPI–2–RF scale scores to differentiate between these broad diagnostic categories. Based on content and convergent validity evidence presented in the MMPI–2–RF test manuals (Ben-Porath & Tellegen, 2008/2011), which is summarized in Table 1, we hypothesized that at the H-O scale level individuals with MDD would be best identified by Emotional/Internalizing Dysfunction (EID), whereas individuals with SCZ would be best identified by Thought Dysfunction (THD). At the RC scale level, we believed RC2 (Low Positive Emotions) and RCd (Demoralization) would best identify individuals with MDD, whereas RC6 (Persecutory Ideation) and RC8 (Aberrant Experiences) would best identify individuals with SCZ. However, we left open the possibility that RC2, reflecting anhedonia, could also be predictive of SCZ, but expected that individuals

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Table 1. Included MMPI–2–RF scales: Abbreviations, names, descriptions, and Cronbach’s α calculated using the sample’s responses.

<table>
<thead>
<tr>
<th>Scale abbreviations and names</th>
<th>Scale description</th>
<th>α</th>
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<tr>
<td><strong>Higher-Order (H-O) scales</strong></td>
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<td></td>
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<tr>
<td>EID</td>
<td>Emotional/Internalizing Dysfunction</td>
<td>.93</td>
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<td>THD</td>
<td>Thought Dysfunction</td>
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<td><strong>Restructured Clinical (RC) scales</strong></td>
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<td>Demoralization</td>
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<tr>
<td>RC2</td>
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<td>Ideas of Persecution</td>
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<tr>
<td>RC8</td>
<td>Aberrant Experiences</td>
<td>.77</td>
</tr>
<tr>
<td><strong>Specific Problems (SP) scales</strong></td>
<td></td>
<td></td>
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<tr>
<td>SUI</td>
<td>Suicidal/Death Ideation</td>
<td>.76</td>
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<tr>
<td>HLP</td>
<td>Helplessness/Hopelessness</td>
<td>.66</td>
</tr>
<tr>
<td>SFD</td>
<td>Self-Doubt</td>
<td>.76</td>
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<td>NFC</td>
<td>Inefficacy</td>
<td>.77</td>
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<td>SAV</td>
<td>Social Avoidance</td>
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<td>DSF</td>
<td>Disaffliativeness</td>
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<td><strong>Interest scales</strong></td>
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<td>AES</td>
<td>Aesthetic-Literary Interests</td>
<td>.68</td>
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<td>MEC</td>
<td>Mechanical-Physical Interests</td>
<td>.72</td>
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<td><strong>Personality Psychopathology Five–Revised (PSY–5–R) scales</strong></td>
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<td>PSYC-r</td>
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<tr>
<td>INTR-r</td>
<td>Introversion/Low Positive Emotionality</td>
<td>.85</td>
</tr>
</tbody>
</table>
| Kotov et al., 2011; Krueger & Markon, 2006). Second, the MMPI–2–RF RC scales assess major dimensions of personality and affect (Tellegen et al., 2003), which in turn have been suggested as useful in delineating core symptomatic expressions of major mental disorders and in differentiating between disorder classes (Clark, 2005). Previous empirical research has suggested the RC scales demonstrate convergent and discriminant validity comparable to, or better than that demonstrated by the original Clinical scales (e.g., Tellegen et al., 2006) and are useful in differential diagnosis (e.g., Sellbom, Ben-Porath, & Bagby, 2008). Finally, the MMPI–2–RF contains 25 Specific Problem scales and Interest scales, intended to provide a more detailed and nuanced assessment of the constructs assessed higher in the MMPI–2–RF hierarchy (Tellegen & Ben-Porath, 2008/2011). Given their purpose, these scales in particular might be useful in the task of differential diagnosis due to the narrowband measurement they represent, which increases their potential for specificity.

Given the limitations of previous studies examining the utility of MMPI instruments in differentiating between SCZ and MDD, this study was designed to examine the potential contribution of MMPI–2–RF H-O, RC, SP, and Interest scales to the differential diagnosis of SCZ and MDD. To examine the utility of the MMPI–2–RF scales for this purpose, we examined the ability of selected MMPI–2–RF scale scores to differentiate between these broad diagnostic categories. Based on content and convergent validity evidence presented in the MMPI–2–RF test manuals (Ben-Porath & Tellegen, 2008/2011), which is summarized in Table 1, we hypothesized that at the H-O scale level individuals with MDD would be best identified by Emotional/Internalizing Dysfunction (EID), whereas individuals with SCZ would be best identified by Thought Dysfunction (THD). At the RC scale level, we believed RC2 (Low Positive Emotions) and RCd (Demoralization) would best identify individuals with MDD, whereas RC6 (Persecutory Ideation) and RC8 (Aberrant Experiences) would best identify individuals with SCZ. However, we left open the possibility that RC2, reflecting anhedonia, could also be predictive of SCZ, but expected that individuals
with MDD would be characterized by relatively higher scores on this scale when compared to individuals with SCZ. We also hypothesized that differentiation between MDD and SCZ would be assisted by the revised Personality/Psychopathology–Five (PSY–5-r) scales, Introversion/Low Positive Emotionality (INTR-r) and Psychoticism (PSYC-r), which provide broad measurement of enduring personality traits on the MMPI–2–RF. Specifically, we hypothesized that individuals with MDD would be characterized by higher scores on INTR-r, whereas individuals with SCZ would be characterized by relatively higher scores on PSYC-r.

We also hypothesized that the narrow-band measurement provided by the SP and Interest scales on the MMPI–2–RF, which were not available on previous instruments in the MMPI family, would assist in differentiating between SCZ and MDD. Based on content and convergent validity evidence presented in the MMPI–2–RF test manuals (Ben-Porath & Tellegen, 2008/2011), which is summarized in Table 1, we hypothesized that individuals with MDD would be best identified by scores on internalizing SP scales, which represent facets of RCd (i.e., Suicidal Ideation [SUI], Helplessness/Hopelessness [HLP], Self-Doubt [SFD], and Inefficacy [NFC]), as well as scores on Social Avoidance (SAV; reflecting social avoidance due to anhedonia in individuals with MDD). Conversely, previous research by Blanchard and colleagues (Blanchard, Horan, & Brown, 2001; Blanchard, Mueser, & Bellack, 1998) has suggested individuals with SCZ experience enduring difficulties with social anhedonia (which can be defined as a lack of pleasure derived from social-interpersonal sources; Eckblad, Chapman, Chapman, & Mishlove, 1982) and physical anhedonia (which can be defined as decreased pleasure being derived by physical activities and experiences; Chapman & Chapman, 1978) when compared to those with MDD. As such, we expected individuals with SCZ would be best identified by MMPI–2–RF scales that have the potential to tap into more stable aspects of anhedonia. Specifically, we hypothesized that individuals with SCZ would likely have higher scores on the Disaffiliativeness (DSF) interpersonal SP scale, which we believed would reflect social anhedonia symptoms, as well as by low scores (i.e., T < 39) on the MMPI–2–RF Interest scales, Mechanical/Physical Interests (MEC) and Aesthetic/Literary Interests (AES), which we believed would reflect physical anhedonia symptoms.

Finally, we aimed to determine whether the MMPI–2–RF scale scores allowed for increased discrimination between SCZ and MDD when compared to the Clinical and Content scales of the MMPI/MMPI–2. To examine this question, we also examined the differentiation between SCZ and MDD provided by Clinical Scales 2 (Depression), 6 (Paranoia), and 8 (Schizophrenia), as well as for Content Scales Depression (DEP) and Bizarre Mentation (BIZ) in our sample. We selected these scales for comparison as they have been identified in previous research as being useful in making differential diagnoses between SCZ and MDD (Ben-Porath et al., 1991; Goldberg, 1965; Mehl & Dahlstrom, 1960). We then rationally compared these results to those obtained in our study for RC scales corresponding to each of the Clinical and Content scales (i.e., RC2, RC6, and RC8). Previous research contrasting MMPI–2 Clinical and Content scales to RC scales has suggested these scales often have similar evidence supporting convergent validity (for a review, see Graham, 2012). As such, we hypothesized that the examined Clinical, Content, and RC scales would demonstrate good evidence of convergent validity (i.e., medium effect size differences between the two groups) when used to assess the presence of SCZ and MDD symptoms. However, given that the RC scales were designed to have better discriminant validity, as described earlier, we also expected that the RC scales would be better able to distinguish between individuals with SCZ and MDD when contrasted with the selected MMPI–2 Clinical and Content scales (i.e., the RC scales would demonstrate larger effect size differences than Clinical and Content scales).

Method

Participants

Participants in this study were drawn from a large archival database of 2,925 psychiatric inpatient clients referred for inpatient psychiatric treatment at a Veteran’s Administration (VA) hospital or a large, urban tertiary care medical center, both located in Minnesota. These individuals comprise two separate samples, which were combined for purposes of this study. This combined database has been described in greater detail by Arbisi, Ben-Porath, and McNulty (2002, 2003). From this larger sample, we extracted a subsample of 1,544 individuals from the original sample who were diagnosed at intake as having SCZ or MDD. To attempt to minimize confounding symptom overlap, individuals who were assigned diagnoses of both SCZ and MDD were excluded from this subsample.

To reduce error variance, participants’ MMPI–2–RF protocols were excluded from analyses if they produced a content nonresponsive or content responsive invalid profile. In line with recommendations from the MMPI–2–RF Interpretative Manual (Ben-Porath & Tellegen, 2008/2011), MMPI–2–RF protocol invalidity was defined as having a Cannot Say raw (CNS) score ≥ 15; a True Response Inconsistency-r (TRIN-r), Variable Response Inconsistency (VRIN-r), or Uncommon Virtues (L-r) T score ≥ 80; an Adjustment Validity (K-r) T score ≥ 70; a Frequency-Psychopathology-r (Fp-r), Frequency Somatic (Fs), or Symptom Validity-r (FBS-r) scale T score ≥ 100; or a Frequency-r (F-r) score = 120. Scores on the Response Bias Scale (RBS) were not used in this study to define invalid profiles.

When these criteria were applied, a total of 537 individuals (34.8%) were excluded from the final sample. Statistical comparisons of the demographic characteristics of those participants who were retained for the study and those who were excluded were conducted. Results indicated there were no statistically significant differences between included and excluded participants in terms of age, sex, or education. However, results indicated that individuals who were of a minority ethnicity group were more likely to be excluded from the sample than those who were White, χ²(2, N = 1,544) = 35.25, p < .001, ϑ = .15, although this was a small effect size difference. There were also statistically significant, but small effect size differences in the assigned diagnosis as individuals who received an intake diagnosis of SCZ were more likely to produce invalid profiles than those with MDD, χ²(1, N = 1,544) = 40.44, p < .001, ϑ = .16. Individuals who were excluded (M = 23.34, SD
= 21.58) also tended to have a slightly longer length of hospitalization than those who produced valid profiles (M = 20.01, SD = 20.02), \( t(1,539) = 2.92, p = .004, d = .16, \) although again this difference was of a small effect size.

After exclusions, the final sample consisted of 199 individuals who were assigned diagnoses of SCZ, and 808 individuals who were assigned a diagnosis of MDD. The final sample included 735 men and 272 women who ranged in age from 18 to 86 years of age (M = 40.48, SD = 14.38) and had an average of 9.41 (SD = 3.20, range = 1–14) years of education. In terms of ethnicity, 83.5% of the participants indicated they were White, 11.5% indicated they were African American, 4.5% indicated they were of another minority ethnicity, and 0.5% did not report their ethnicity. These individuals’ lengths of hospitalization ranged from 1 to 199 days (M = 20.11, SD = 20.08).

**Measures**

*Minnesota Multiphasic Personality Inventory–2 Restructured Form.* The MMPI–2–RF (Ben-Porath & Tellegen, 2008/2011; Tellegen & Ben-Porath, 2008/2011) is a 338-item, true–false self-report personality and psychopathology inventory. Table 1 provides a listing and description of the scales scored on the MMPI–2–RF included in this study. Table 1 also includes estimates of each scale score’s internal consistency reliability (Cronbach’s \( \alpha \)) calculated using data from the current sample. Overall, estimates of internal consistency were acceptable. Strong evidence in support of validity for MMPI–2–RF scale scores in clinical and nonclinical populations was provided in the MMPI–2–RF Technical Manual, where Tellegen and Ben-Porath (2008/2011) demonstrated each of the included MMPI–2–RF scale scores were related to conceptually relevant criteria. It should be noted MMPI–2–RF scale scores were obtained for use in this study from MMPI–2 responses. Previous research has supported that extraction of MMPI–2–RF scale scores from MMPI–2 responses has no impact on reliability or validity (Tellegen & Ben-Porath, 2008/2011; Van der Heijden, Egger, & Derksen, 2010).

**Intake diagnoses.** In this study, we used diagnoses assigned by the evaluating physician during the intake process. Intake diagnoses were based on *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed. [DSM–III]; American Psychiatric Association, 1980) or *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev. [DSM–III–R]; American Psychiatric Association, 1987) criteria following an extensive clinical interview and observation, and reflect the impression of the evaluating physician shortly after the patient was admitted to the psychiatric unit. Typically, the psychiatrist or psychiatric resident conducting the intake evaluation had access to information obtained from the referral source or medical record, as well as information obtained through direct interview of the patient. These diagnostic assignments were independent of information obtained from the MMPI–2, as they were made prior to administration of this instrument (on average 7 days prior to administration of the MMPI–2). Subsequently, intake diagnoses were coded by research assistants on a Record Review Form (RRF) as part of a standardized chart review and data extraction for the participants’ index hospitalization.

**Procedure**

The archival data set included MMPI–2 responses, as well as variables coded on the RRF, which was designed specifically for use at the two inpatient sites as a way of reliably extracting clinical information from participants’ records. All patient information was deidentified during the data archiving process. Psychiatric inpatients were referred for a psychological evaluation if there were questions from the inpatient treatment team regarding diagnostic formulation or treatment planning. Participants in both settings were administered the MMPI–2 under standard instructions. Participants from the VA setting were administered a computerized version of the MMPI–2, whereas participants from the county hospital setting were administered the standard booklet version of the MMPI–2. Chart reviews took place after participants were discharged, and information about the individual obtained during the intake procedure and treatment was coded on the RRF.

**Results**

Our first set of data analyses examined the ability of MMPI–2–RF scale scores to differentiate between individuals with SCZ and MDD. We first conducted several multivariate analyses of variance (MANOVAs) by scale family (e.g., H-O, RC, SP) to determine if there were differences in scale scores between individuals diagnosed with SCZ and MDD when the MMPI–2–RF scales at each level of the hierarchy were considered as a related set. MANOVA results indicated there were statistically significant differences between the two diagnostic groups for the H-O, F(2, 1004) = 190.07, \( p < .001 \), Wilks’s \( \lambda = .725 \), partial \( \eta^2 = .28 \); RC, F(4, 1002) = 90.51, \( p < .001 \), Wilks’s \( \lambda = .735 \), partial \( \eta^2 = .27 \); SP, F(6, 1000) = 30.70, \( p < .001 \), Wilks’s \( \lambda = .840 \), partial \( \eta^2 = .16 \); Interest, F(2, 1004) = 11.79, \( p < .001 \), Wilks’s \( \lambda = .977 \), partial \( \eta^2 = .02 \); and PSY5-r, F(2, 1004) = 80.45, \( p < .001 \), Wilks’s \( \lambda = .862 \), partial \( \eta^2 = .14 \), scales.

As there were score differences indicated for each scale set in the MANOVAs, follow-up analyses of variance (ANOVAs) were calculated. These analyses allowed us to examine which specific diagnostic group was differentiated from the other by individual MMPI–2–RF scale scores. The practical effect of any significant differences for an ANOVA were characterized using Cohen’s (1988) \( d \) statistic, with .2, .5, and .8 reflecting small, medium, and large effect sizes, respectively. To facilitate our goal of contrasting the ability of selected MMPI–2 and MMPI–2–RF scales, we also conducted ANOVAs for the selected MMPI–2 Clinical and Content scales at this time.

The follow-up ANOVA results, as seen in Table 2, suggested that when compared to the SCZ group, the MDD group obtained higher mean scores with large effect size differences on MMPI–2–RF substantive scales EID, Rcd, RC2, SUI, and SFD. Results also indicated the MDD group scored higher than the SCZ group on HLP and INTR-r, although these differences were only of a moderate effect size. Finally, small effect size differences in scores were demonstrated for NFC and SAV, with the MDD group scoring higher than the SCZ group. However, it should be noted that the mean scores in the higher scoring MDD group were not clinically elevated, with mean T scores equal to 59.93 (SD = 12.29) on NFC and 59.03 (SD = 13.33)
on SAV. Results of these analyses for the selected MMPI–2 Clinical and Content scales indicated those individuals with MDD had significantly higher scores of a large effect size on MMPI–2 Scales 2 and DEP. Unexpectedly, individuals with MDD were also demonstrated to have statistically higher mean scores on RCd and PSYC-r. Conversely, results indicated the SCZ group achieved higher mean scores on MMPI–2–RF scales with a large effect size difference on THD when compared to the MDD group. Effect size differences nearing a large effect, with individuals in the SCZ group scoring higher than the MDD group, were also demonstrated for RC6 and PSYC-r. Additionally, when compared to the MDD group, results indicated the SCZ group achieved higher mean scores with small effect size differences on RC8 and AES. It should be noted that the score differences for AES were not in the expected direction, as we hypothesized that individuals in the SCZ group would score significantly lower, not higher, than individuals in the MDD group. Finally, results for the selected MMPI–2 scales indicated individuals with SCZ scored significantly higher on BIZ than those with MDD and this was a large effect size. There were no differences in mean scores demonstrated for Scale 6 (Pa).

To further explore the practical effect of any differences that were demonstrated, we calculated odds ratios (OR) for each of the examined MMPI–2–RF and MMPI–2 scales. These analyses were calculated using the diagnostic group that was demonstrated to score higher in the ANOVAs as the reference group. The ORs were used to describe the odds of being assigned to a particular diagnostic group (reference group) when compared to the other diagnostic group if an elevated score on the examined MMPI scale was obtained. For example, an OR of 2.00 indicates that those individuals who scored at or above the cut-off were two times as likely to be assigned the diagnosis of the reference group (e.g., MDD or SCZ) as those who scored below the cutoff on the scale. ORs in which the 95% confidence interval does not include 1.00 are statistically significant at $p < .05$.

We calculated ORs for two levels of clinical elevation on the MMPI scales, which were intended to represent elevated scores and highly elevated scores. For a majority of scales examined, these two levels of elevation were defined using $T = 65$ and $T \geq 80$, representing individuals who achieved scores 1.5 $SD$ and 3 $SD$ above the mean score in the normative sample (i.e., $T = 50$). However, for SFD, a scale on which it is impossible to achieve a $T \geq 80$, we examined $T \geq 70$, which is the second level of elevation recommended by Ben-Porath and Tellegen (2008/2011) in the MMPI–2–RF Manual for Interpretation and Scoring. In the analyses, we only examined $T \geq 65$ for AES, as it is impossible to achieve a $T$ score of 80 on this scale and there is no higher level of elevation suggested for interpretation by Ben-Porath and Tellegen (2008/2011).

ORs associated with scales on which ANOVA results suggested the MDD group scored higher when compared to the SCZ group are displayed in Table 3. Overall, results of these analyses indicated that individuals with elevated scores (i.e., $T \geq 65$ or 80) had a significantly higher likelihood of being diagnosed with MDD when compared to SCZ on all of the examined scales. The greatest odds of being diagnosed with MDD when compared to SCZ were associated with those scales that demonstrated the largest effect size differences in the ANOVAs when considering scores at or above $T = 65$, including MMPI–2–RF scales EID (OR = 4.99), Rcd (OR = 4.71), SUI (OR = 4.62), and SFD (OR = 4.45), as well as MMPI–2 Scale 2 (OR = 6.36) and DEP (OR = 5.23). When considering scores at or above $T = 80$, the greatest odds of being diagnosed with MDD compared to SCZ were associated with MMPI–2–RF scales EID (OR = 6.12) and Rcd (OR = 5.89), as well as MMPI–2 Scale 2 (OR = 5.58) and DEP (OR = 5.72).

ORs associated with scales on which ANOVA results suggested the SCZ group scored higher when compared to the MDD group are displayed in Table 4. Overall, results of these analyses indicated that individuals with elevated scores (i.e., $T \geq 65$ or 80) had a significantly higher likelihood of being diagnosed with SCZ when compared to MDD on all of the examined scales. When considering scores that were at or above
Note. N = 1,007. TP = true positive cell; FP = false positive cell; FN = false negative cell; TN = true negative cell; OR = odds ratio; CI = confidence interval; EID = Emotional/Internalizing Dysfunction; RC6 = Demoralization; RC2 = Low Positive Emotions; SUI = Suicidal/Death Ideation; HLP = Helplessness/Helplessness; SFD = Self-Doubt; RFC = Inefficacy; SAV = Social Avoidance; INTR-r = Intrusion/Low Positive Emotionality-Revised; 2(D) = Clinical Scale 2 (Depression); 8Sc = Clinical Scale 8 (Schizophrenia); DEP = Content Scale Depression.

*RF scale cut-score of T ≥ 70 used, as recommended in test's manual.

*95% CI does not include 1.00, thus p ≤ .05.

**Discussion**

This study examined the ability of selected MMPI–2–RF substantive scales to assist clinicians in inpatient settings with the differential diagnosis of SCZ and MDD. Overall, results suggest that scores on the examined H-O, RC, and PSY–5-r (Personality Psychopathology Five–Revised) scales of the MMPI–2–RF provide important information for the differential diagnosis of MDD and SCZ to clinicians working in inpatient settings. Specifically, results of the ANOVA and OR analyses supported our hypotheses that individuals with MDD would be best differentiated from individuals with SCZ by higher scores on the H-O scale EID, RC scales RC6 and RC2, and the PSY-5-r scale INTR-r. Results of these analyses also supported our hypotheses that individuals with SCZ would be best differentiated from individuals with MDD by higher scores on H-O scale THD, RC scales RC6 and RC8, and the PSY-5-r scale PSYC-r.

Inspection of the results of ANOVA and OR analyses provided mixed support for our hypotheses about which of the MMPI–2–RF Specific Problems (SP) and Interest scales would best differentiate between MDD and SCZ. In support of our hypotheses about SP scales that are facets of RCd being useful in differentiating MDD from SCZ, results of both ANOVAs and OR analyses suggested scores on SUI and SFD were highly effective in identifying individuals with MDD. Results also suggested scores on HLP were moderately effective for this purpose. However, results did not support our hypotheses about scores on NFC. Additionally, there was no support for our hypotheses about the utility of SAV, DSF, MEC, and AES in differentiating between the anhedonic symptoms experienced by individuals with SCZ and MDD.

One of the other goals of this study was to examine whether the MMPI–2–RF scale scores allowed for increased discrimination between SCZ and MDD when compared to the Clinical and Content scales of the MMPI/MMPI–2. To examine this question, we calculated and rationally compared the effect sizes and ORs of the RC scales corresponding to the constructs assessed by the Clinical and Content scales (i.e., RCd, RC2, RC6, and RC8). Overall, the results suggested that the RC scales likely provide a similar or increased level of discrimination between individuals with MDD and SCZ when compared to Clinical and Content scale counterparts scored on the MMPI–2. Specifically, the effect sizes for Scales 2, DEP, and RC2 in this study were all within the large range (d ≥ 1 for Scale 2 and DEP, d = .91 and .79 for RCd and RC2, respectively).
Examination of the ORs indicated elevated scores on Scale 2, DEP, and RCd were all associated with at least a fourfold increase in the likelihood that an individual would be diagnosed with MDD compared to SCZ. We would suggest that EID, Scale 2, and DEP appeared to work similarly because these scales assess equally broad constructs that capture multiple aspects of MDD. Alternatively, the slightly smaller effect sizes demonstrated for RCd and RC2 are likely a result of the fact that components of MDD (e.g., distress and anhedonic mood) are assessed separately by the MMPI–2–RF RC scales (i.e., RCd assesses distress and RC2 assesses anhedonic mood). Indeed, we conducted three post-hoc logistic regression analyses examining the prediction of diagnosis (i.e., MDD or SCZ) using only Clinical Scale 2, only Content scale DEP, and both RCd and RC2. Overall, results suggested these scales are all accounting for approximately the same proportion of variance in diagnosis (Nagelkerke $R^2 = .22, .21,$ and $.19$ for prediction by Scale 2, DEP, and RCd and RC2, respectively). Additionally, when diagnosis was predicted using these various scales the proportion of MDD cases that were correctly classified were also similar (correct classification $= 95.5\%, 95.9\%,$ and $.97.3\%$ for Scale 2, DEP, and RCd and RC2, respectively).

For the assessment of psychotic symptoms, RC6 and RC8 ($d = -.76$ and $-.46$) appeared to provide a similar level of discrimination as would have been available from Content scale BIZ, which demonstrated an effect size in the moderate range ($d = -.68$). However, increased discriminant ability was demonstrated for RC6 and RC8 when contrasted with Clinical Scales 6 and 8, both of which demonstrated small to negligible effect sizes ($d = -.04$ [Scale 6], $d = .26$ [Scale 8]). This same pattern of results was demonstrated when we compared results of the OR analyses in this study, as well as the effect sizes of the RC scales in our study to those reported for the Clinical and Content scales of the MMPI–2 by Ben-Porath et al. (1991), who also examined the ability of MMPI–2 scales to differentiate between MDD and SCZ in an inpatient sample. The enhanced ability of scores on RC6, RC8, and BIZ to correctly identify cases of SCZ when compared to Scale 6 and Scale 8 is likely a result of these scales being less saturated with generalized distress (Tellegen & Ben-Porath, 2008/2011), which is common to both MDD and SCZ. In other words, RC6, RC8, and BIZ are more likely to be assessing those experiences that are unique to psychotic disorders (e.g., delusional beliefs and unusual sensory experiences) when compared to Scales 6 and 8.

There are limitations of this study that warrant mention. This study was conducted using an archival sample of individuals receiving treatment in one of two inpatient hospitals. To be hospitalized, it is likely that these individuals presented with numerous and severe symptoms of their primary difficulties. As such, the results of this study are only applicable to similar settings in which the individuals being assessed are experiencing acute and severe symptoms. In settings where individuals with less severe symptoms are assessed, MMPI–2–RF scales highlighted in this study as being useful for assisting in differential diagnosis might not be as discriminating. This is especially likely to be true for those scales that demonstrated small to moderate effect size differences in this study.

Another limitation of this study was a reliance on diagnoses assigned by the primary physician at intake to create the groups of individuals with MDD and SCZ. Due to the real-world setting in which the data were originally collected, no data were available to establish the reliability of these diagnoses. However, these diagnoses were established after an extensive clinical interview and observation, thus increasing the likelihood that they accurately represent a description of each individual’s presenting difficulties. Additionally, as mentioned, psychological assessment was not routinely obtained for all individuals admitted to the psychiatric wards. Only those individuals who presented a diagnostic conundrum or where issues arose regarding treatment planning were referred for additional evaluation. Consequently, the findings of this study are limited to less clear-cut cases of MDD and SCZ where these diagnoses were suggested at intake, but questioned by the treatment team after a period of observation on the inpatient psychiatric ward.

A further limitation is that the findings reflect only patients who produced valid MMPI–2–RF protocols. Demographic analyses indicated that individuals with SCZ were more likely than those with MDD to produce invalid MMPI–2–RF profiles. This difference might have been in part due to individuals with SCZ being unable to complete the test appropriately as a consequence of the level of disorganization associated with their disorder. This idea is supported by post-hoc analyses we conducted suggesting individuals with SCZ were significantly more likely than individuals with MDD to produce a content nonresponsive Validity scale profile and to have significantly higher mean scores on VRIN-r and TRIN-r, both of which indicate individuals with SCZ were less able to attend to the content of items appropriately while completing the instrument. On the other hand, this difference could also be related to the idea that noncredible responding on the MMPI–2 and MMPI–2–RF is marked by overreporting of psychotic symptoms that would likely be reflected during the intake interview (Arbisi & Ben-Porath, 1998; Goodwin, Sellbom, & Arbisi, 2013). Consequently, those who were excluded from the analyses for noncredible reporting would more likely appear psychotic to the psychiatrist or psychiatric resident conducting the intake interview. Post-hoc difference tests conducted in this study’s sample also support this idea, as results suggest that when compared to those with MDD, individuals with SCZ had significantly higher mean scores on Fp-r, which assesses the noncredible endorsement of unusual psychiatric symptoms. Given this limitation, any statements about the utility of scales examined in this study in assisting in differential diagnosis are limited to individuals with MDD and SCZ who are able to validly complete the MMPI–2–RF.

In summary, results of this study support previous research suggesting that MMPI–2–RF scale scores can be helpful in differential diagnosis (e.g., Sellbom et al., 2008) and indicate that scales of the MMPI–2–RF provide similar or increased discrimination between SCZ and MDD when compared to scales scored on the MMPI–2 (Ben-Porath et al. 1991). In terms of clinical applications, results suggest in an inpatient setting that the best identification of individuals with MDD will be achieved through an examination of scores on EID, RCd, RC2, INTR-r, SUI, and SFD. If an individual achieves a T score of 65 or greater on these scales, a diagnosis of MDD should be strongly considered. Further, MDD should be even more strongly considered if an individual has a T score of 80 or higher on EID or...
Second, results of this study suggest the best identification of individuals with SCZ in inpatient settings will be achieved through examination of scores on THD, RC6, RC8, and PSYC-R. If an individual achieves a T score of 65 or greater on these scales, a diagnosis of SCZ should be considered, and strongly considered if the T score obtained on THD is 80 or higher.

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**References**


