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The MMPI–2 Clinical Scales and Restructured Clinical (RC) Scales: Comparative Psychometric Properties and Relative Diagnostic Efficiency in Young Adults

TIMOTHY M. OSBERG, ERIN N. HASELEY, AND MICHELE M. KAMAS

Department of Psychology, Niagara University

We examined the psychometric properties of the Restructured Clinical (RC) scales (Tellegen et al., 2003) of the MMPI–2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) in a large sample ($N = 744$) of 18-year-old college freshman. We found that the RC scales demonstrated good convergence with their Clinical scale counterparts and were more distinctive than the Clinical scales. The patterns of discriminant correlations for the RC scales were slightly clearer than those of the Clinical scales and a set of other existing MMPI–2 scales. Diagnostic efficiency statistics based on Clinical and RC scale elevation status did not differ appreciably. However, the diagnostic efficiency statistics of cutoff scores derived from mean RC and Clinical scale T scores improved on the traditional scale elevation measures. We consider the clinical implications of these findings.

An important development in the evolution of the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) has been the recent publication of the new MMPI–2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) Restructured Clinical (RC) scales (Tellegen et al., 2003). Tellegen et al.'s (2003) goals in developing the RC scales included the removal of a demoralization factor known to pervade the Clinical scales and thereby to produce scales that are conceptually more distinct. It had long been known to researchers, if not practicing clinicians in the field, that the MMPI, aside from tapping 10 clinical dimensions, contained a "first factor" (see Archer, 2006, for an excellent discussion of the first factor), which seemed to capture a dimension reflecting anxiety and overall maladjustment (Wiggins, 1973). Owing largely to the process of empirical criterion keying, the Clinical scales of the MMPI and its successor were saturated with such items. This scale construction strategy led to significant item overlap among the Clinical scales, resulting in the large intercorrelations known to exist among the MMPI and MMPI–2 Clinical scales.

Beyond their saturation with the demoralization factor, it has been noted that the heterogeneity of the item content of the Clinical scales often rendered scale elevations difficult to interpret (e.g., Helmes & Reddon, 1993). The heterogeneity of the Clinical scales led to the development of special scale sets such as the Harris–Lingoes Scales (Harris & Lingoes, 1955; Lingoes, 1960) and the MMPI–2 Content scales (Butcher, Graham, Williams, & Ben-Porath, 1990) to enable clinicians and researchers to identify the origins of scale elevations. Tellegen et al.'s development of the RC scales addressed these shortcomings in the Clinical scales through a four-step process. Tellegen et al. assembled items tapping the first factor, which was labeled "demoralization," identified the distinct "core component" of each Clinical scale, constructed "seed scales" for each core component from the Clinical scale items, and derived RC scale items from the entire MMPI–2 item pool (p. 11). The resulting RC scales included Demoralization (RCd, dem), Somatic Complaints (RC 1, som), Low Positive Emotions (RC2, lpe), Cynicism (RC3, cyn), Antisocial Behavior (RC4, asb), Ideas of Persecution (RC6, per), Dysfunctional Negative Emotions (RC7, dne), Aberrant Experiences (RC8, abx), and Hypomanic Activation (RC9, hpm).

In their monograph, Tellegen et al. (2003) reported analyses, based on the original MMPI–2 normative sample and three additional clinical samples, and provided evidence of the improved distinctiveness of the new set of RC scales along with data supporting their improved convergent and discriminant validity. The RC scales were less intercorrelated than the Clinical scales and demonstrated clearer convergent and discriminant validity patterns when compared to extratest criteria.

RESEARCH PUBLISHED SINCE THE RC SCALES MONOGRAPH APPEARED

Initial research appearing since the publication of the RC scales has been largely supportive of their improved psychometric properties relative to the original Clinical scales. Sellbom and Ben-Porath (2005) demonstrated the greater convergent and discriminant validity of the RC scales when compared to the Clinical scales in a large sample of college students using a new multidimensional scale of normal personality as a criterion measure (Tellegen, in press). Sellbom, Ben-Porath, and Graham (2006) found that the RC scales, relative to the Clinical scales, have conceptually clearer patterns of convergent and discriminant validity with respect to therapist ratings of clients in a university counseling center. Moreover, Sellbom, Ben-Porath, Graham, Arbisi, and Bagby (2005) analyzed five archival samples (including college students, psychiatric inpatients, and medical patients) and determined that the RC scales are no more subject to overreporting or underreporting (under standard vs. overreporting instructions) than are the Clinical scales when item subtlety is taken into consideration.

In one of only two published studies of the RC scales not conducted by the original research group who developed the scales, Wallace and Liljequist (2005) analyzed 150 MMPI–2 protocols from clients at an outpatient treatment center. Replicating the findings reported by Tellegen et al. (2003), Wallace and

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Address correspondence to Timothy M. Osberg, Department of Psychology, DePaul Hall, Niagara University, NY 14109-2208; Email: tosberg@niagara.edu

Liljequist found that the RC scales were strongly correlated with their K-corrected Clinical scale counterparts and yet were less intercorrelated than the clinical scales.[1] In the other independent evaluation of the RC scales, Simms, Casillas, Clark, Watson, and Doebbeling (2005), who used samples of psychology clinic clients and military veterans, demonstrated that the RC scales are as internally consistent as the Clinical scales and are highly correlated with their Clinical scale counterparts.[2] Moreover, these authors found the RC scales to be less intercorrelated than were the Clinical scales and to demonstrate clearer patterns of convergent and discriminant validity in relation to other measures of personality and psychopathology. Simms et al. also provided useful normative data for these populations. In addition, Simms et al. examined the incremental validity of the RC scales when compared to the Clinical scales, via a series of hierarchical regression analyses, in predicting the preceding criteria. Both sets of scales added incrementally to the prediction of the personality criteria, with the magnitude of incremental effects generally larger for the RC scales. Neither set of scales demonstrated much in the way of incremental validity over the other in the prediction of the psychopathology criteria. The lone exception involved current and lifetime ratings of substance use disorders, wherein the RC scales demonstrated incremental validity, an effect accounted for largely by RC4.

Criticisms of the RC Scales

Despite these encouraging initial studies, the RC scales have recently come under critical scrutiny. The most vocal critic has been Nichols (2006b) who argued, among other things, that the new RC scales are redundant with some of the MMPI–2 Content scales (Butcher, Graham, Williams, et al., 1990), that RCd is an atypical and depressively biased marker of the first factor, and that scales RC7 and RC9 show evidence of "construct drift" from their original Clinical scales. Rogers, Sewell, Harrison, and Jordan (2006) described the development of the RC scales as a significant departure from the empirical approach used to develop the Clinical scales. Although they provide evidence supporting the internal structure of the RC scales and generally cross-validating the content of the RC seed scales (with the exception of RC9), Rogers et al. criticized them as overly likely to yield within-normal-limits (WNL) profiles and concluded that RC9 is the weakest of the scales, requiring further work. The original authors (Tellegen et al., 2006) of the RC scales have provided a rebuttal to these criticisms, and a series of commentaries have followed (e.g., Archer, 2006; Butcher, Hamilton, Rouse, & Cumella, 2006; Caldwell, 2006; Finn & Kamphuis, 2006; Nichols, 2006a, Rogers & Sewell, 2006; Simms, 2006; Weed, 2006), which will likely set the RC scale research agenda for the foreseeable future. Although an examination of all the issues raised in this conversation among MMPI scholars is beyond the scope of this article, we address some of them in the data we report in this article.

Goals of this Research

In this research, we sought to provide another independent evaluation of the RC scales. We chose to study a population wherein the MMPI–2 Clinical scales were known to have some shortcomings. Previous MMPI research had found the existence of age effects (i.e., younger respondents obtaining higher raw scores) in responding to some MMPI Clinical scales (e.g., Archer, 1992; Colligan & Offord, 1992) and the "overpathologizing" of adolescents by the MMPI (Archer, 1984; Butcher & Williams, 1992). Concerning the MMPI–2, previous research with college students by Butcher, Graham, Dahlstrom, and Bowman (1990) provided evidence of slight elevations on Scales 7, 8, and 9 within their sample when compared to the MMPI–2 normative sample. Head-to-head comparisons of the MMPI–Adolescent (MMPI–A; Butcher et al., 1992) and the MMPI–2 found that the latter overpathologizes younger respondents. For example, Shaevel and Archer (1996) scored the MMPI–A protocols of fifty 18-year-old respondents from among a larger sample of psychiatric inpatients and outpatients with MMPI–2 norms. The MMPI–2 manual (Butcher et al., 1989) allows that this age group may be administered either the MMPI–A or the MMPI–2 and offers guidelines on which test to use. Shaevel and Archer found that when scored against MMPI–2 norms, the participants' profiles were significantly more elevated when compared to their MMPI–A profiles. Osberg and Poland (2002) replicated this effect when administering both entire tests to a sample of 18-year-old college students whose levels of psychopathology were more heterogeneous.

Thus, a major objective of this study was to explore the psychometric properties of the MMPI–2 RC scales, relative to the Clinical scales, in a large sample of 18-year-old college students. Although this group represents a sample of convenience, given the university setting in which we work, use of such a sample allowed us to compare the diagnostic efficiency statistics of the RC scales to those obtained for the MMPI–A and MMPI–2 clinical scales by Osberg and Poland (2002) in a similarly aged sample.

We explored a variety of the psychometric characteristics of the RC scales reported in the monograph by Tellegen et al. (2003) and the other studies cited previously. In addition, we examined the relative psychometric properties of an alternative set of MMPI–2 scales (drawn from the Content and Harris–Lingoes scale sets) as well as the Personality Psychology Five (PSY–5) scales (Harkness, McNulty, Ben-Porath, & Graham, 2002), which Nichols (2006b) has suggested overlap considerably with the RC scales and that have been compared to the RC scales in one recent study by Sellbom, Ben-Porath, and Graham (2006). These scales included Welsh's Anxiety (A) scale, considered as an alternative to RCd, and health concerns (HEA), introversion/low positive emotion (INTR), cynicism (CYN), antisocial practices (ASP), persecutory ideas (Pa1), neuroticism/negative emotional experiences (NEGE), bizarre mentation (BIZ), and psychomotor acceleration (Ma2), considered to be comparable to RC1 through RC9, respectively. We also compared the profile elevation rates of the Clinical scales and RC scales given Rogers et al.'s (2006) criticism that the latter yield relatively high rates of WNL profiles (>40%) in clinical samples.

[1] With the exception of RC3, which correlated –.42 with Scale 3, Tellegen et al. (2003) reported scale pair correlations (non-K-corrected) ranging from .38 to .89 in the MMPI–2 normative sample of men. The range for women in the normative sample was from .41 to .92, not including the RC3/Scale3 correlation of –.24.

[2] Simms et al. (2005) reported scale pair correlations ranging from .65 to .95 among psychological clinic patients and .57 to .95 among veterans, not including the RC3/Scale 3 pair, which correlated –.12 and –.14 in these samples, respectively.

A subset of our sample also was administered a separate measure of psychopathology status, enabling us to explore the comparative diagnostic efficiency statistics of the original Clinical scales and the RC scales. These participants were screened for the presence or absence of significant psychopathology using the Symptom Checklist–90–Revised (SCL–90–R; Derogatis, 1983). We employed the SCL–90–R to provide a global index of the presence or absence of significant psychopathological symptoms.

We also sought to compare various indexes of profile elevation as a part of our analyses of the relative diagnostic efficiency of the Clinical and RC scales. Because clinicians and researchers often are interested in using MMPI–2 results to aid in judging the clinical versus nonclinical status of respondents, Graham, Barthlow, Stein, Ben-Porath, and McNulty (2002) recently compared various MMPI–2 indexes of profile elevation to a composite criterion measure of overall maladjustment. Graham et al. found that the mean T score for the eight Clinical scales (omitting Scales 5 and 0), which they labeled *M*8, was the most valid indicator of maladjustment. Thus, we included M8 and, correspondingly, mean RC scale T score in our analyses exploring MMPI–2 diagnostic efficiency statistics in the prediction of the criterion measure of psychopathology status.

In summary, we sought the answers to several questions concerning the comparative utility of the MMPI–2 Clinical and RC scales in young adults. Will the desirable psychometric advantages of the RC scales be evident in this young adult sample? How will the psychometric characteristics of the RC scales compare to those of the alternative set selected from among the Content, PSY–5, and Harris–Lingoes scales? How will the clinical elevation status of the Clinical scales versus RC scales compare? How will measures of clinical elevation status based on the RC scales compare in diagnostic efficiency to those based on the original Clinical scales when matched against a self-report criterion of maladjustment?

METHOD

Participants

The participants for this investigation included three separate cohorts of freshman college students (Fall 2002, 2003, and 2004) from a northeastern university who were tested midway through their first semester. They were recruited as part of an ongoing study of psychological factors in college student retention being conducted by T. M. Osberg. Combining the three samples yielded a total of 1,103 participants, of whom 397 were men and 705 were women, with 1 participant failing to indicate gender. The greater proportion of female participants reflects the overall demographics of the university at which this study was conducted. The total number of incoming students for these three cohorts was 2,153. Thus, the total number of participants in this study reflects an excellent sampling rate of nearly 50% of all incoming freshman students.

Incoming freshmen ranged in age from 17 to 23, but only 18-year-olds were retained for this study, given the questions addressed in this research. In addition, we applied the criteria described by Butcher, Graham, and Ben-Porath (1995) for excluding invalid MMPI protocols in research based on number of omitted responses (>30) and elevations on L (T > 80), F (raw score > 30), K (T > 80), TRIN (raw score ≥ 13 or ≤ 5), and VRIN (T > 80). Given that some of the items from the RC scales are contained in the back half of the MMPI-2 test booklet, we also excluded participants with profiles having an F_b T score ≥ 90. This is recommended in the revised edition of the MMPI–2 manual when scales containing items from this portion of the test are to be interpreted by the clinician or used in research (Butcher et al., 2001). The exclusion of participants who were not 18 years old ($n = 184$) and those with invalid profiles ($n = 175$) reduced the final sample to 744 participants (229 men, 515 women).

Procedures

All procedures and measures employed in this research were approved by the university's institutional review board. Recruitment procedures varied by cohort. Fall 2002 participants were recruited via sign-up sheets circulated in their freshman seminar courses and promised $10 for participating in research examining the "role of psychological factors in college student retention." The Fall 2003 and 2004 cohorts were recruited from their freshman seminar courses as part of a required component of the course for the same retention study and given the same description. Participants were administered the MMPI–2 in groups, held outside of class time, ranging from 5 to 20. Following the administration of the MMPI–2, a subsample of 333 participants (the Fall 2004 cohort) was administered the SCL–90–R (Derogatis, 1983) as a collateral, criterion measure of psychopathology status.

Measures

MMPI–2. The MMPI–2 (Butcher et al., 1989) is a 567-item inventory containing a variety of self-statements to which the respondent answers in a true–false format. Scores on 10 Clinical scales are obtained along with numerous other special subscales including the newly developed RC scales. It is the most widely used (Watkins, Campbell, Nieberding, & Hallmark, 1995) and well-validated self-report measure of psychopathology, with more than 200 articles published using it in any given year (Butcher, 1999). Both Graham (2006) and Greene (2000) have provided comprehensive summaries of the research supporting the reliability and validity of the MMPI–2 as well as information concerning profile interpretation.

SCL–90–R. The SCL–90–R is a 90-item measure of psychopathological symptoms, which is answered by respondents on a Likert scale ranging from 0 to 4 whose endpoints are labeled "*not at all*" to "*extremely*." The Global Severity Index (GSI) of the SCL–90–R was used to screen for participants reporting clinically elevated levels of psychopathological symptoms. Previous research attests to the utility of this index as a measure of global psychopathology in outpatient populations (e.g., Brophy, Norvell, & Kiluk, 1988). This index was the same as that employed in the study by Osberg and Poland (2002) cited earlier, which examined the relative diagnostic efficiency statistics of the MMPI–2 and MMPI–A in 18-year-olds.

The SCL–90–R manual (Derogatis, 1983) recommends that participants with GSI T scores ≥ 63 can be identified as having significant psychopathological symptoms. From among the participants who responded to the SCL–90–R in its entirety ($N = 317$; 16 participants had missing data), those participants with GSI T scores < 63 were included in the psychopathology absent (PA) group ($n = 238$), whereas those participants with GSI T scores ≥ 63 were included in the psychopathology present

(PP) group ($n = 79$). Aside from the GSI, SCL–90–R subscale scores assessing Somatization, Obsessive–Compulsiveness, Interpersonal Sensitivity, Depression, Anxiety, Phobic Anxiety, Hostility, Paranoid Ideation, and Psychoticism served as extratest correlates that allowed us to compare the convergent and discriminant validity patterns of the Clinical, RC, and alternative scales.

Results

Relative Elevation on the RC Versus Clinical Scales

Descriptive data for the MMPI–2 Validity, Clinical, and RC scales are presented in Table 1. K-corrected means and standard deviations are given in parentheses. One question of interest is whether or not the RC scales will yield higher or lower elevations when compared to the Clinical scales. We first explored this on a scale by scale basis here and report comparative overall profile elevation analyses later. Paired sample t tests were conducted to compare the mean T score for each RC scale with its Clinical scale counterpart. Given the number of comparisons, we adopted a conservative alpha of .01 for these analyses. All comparisons between the non-K-corrected Clinical scales and the RC scales were statistically significant (all ps $< .001$), with the exception of the Scale 1 (Hs)/RC1 comparison. RC Scales 2, 4, 7, 8, and 9 had lower mean T scores, whereas RC Scales 3 and 6 had higher mean T scores than their Clinical scale counterparts. However, the absolute value of effect sizes (Cohen's d; see Table 1) ranged from .03 to .29, representing only negligible to small effects. Similar patterns were found for RC Scales 4, 7, 8, and 9 when K-corrected T scores were analyzed (all ps $< .001$; the absolute value of ds ranged from .13–.33). In addition, the mean K-corrected Scale 1 (Hs) was significantly lower than RC1 ($p < .01$, $d = -.08$). Thus, when non-K-corrected comparisons were made, five RC scales yielded lower mean T scores, with two having higher mean scores and 1 demonstrating no mean T-score difference. All T-score differences represented negligible to small effects.

TABLE 1.—Descriptive statistics for the Minnesota Multiphasic Personality Inventory–2 (MMPI–2) Clinical and Restructured Clinical (RC) scales among college freshmen.

Scale	*M*	*SD*	Cohen's *d*
L	49.85	9.30	
F	58.40	15.78	
F_b	57.54	19.14	
F_p	57.44	15.71	
K	48.53	9.80	
S	47.90	10.05	
1. Hypochondriasis	54.83 (54.32)	10.46 (10.42)	
2. Depression	51.54	10.95	
3. Hysteria	51.24	11.07	
4. Psychopathic Deviate	55.21 (54.95)	11.73 (11.48)	
6. Paranoia	53.75	13.27	
7. Psychasthenia	55.13 (55.98)	11.57 (11.58)	
8. Schizophrenia	57.55 (58.73)	12.37 (12.87)	
9. Hypomania	59.02 (59.38)	11.91 (11.95)	
RCd: Demoralization	53.96	10.50	
RC1: Somatic Complaints	55.16	11.17	−.03 (−.08)
RC2: Low Positive Emotions	49.99	11.15	.14
RC3: Cynicism	53.97	9.01	−.27
RC4: Antisocial Behavior	53.47	10.82	.15 (.13)
RC6: Ideas of Persecution	57.40	11.62	−.29
RC7: Dys. Neg. Emotions	52.99	12.03	.18 (.25)
RC8: Aberrant Experiences	54.70	11.88	.24 (.33)
RC9: Hypomanic Activation	55.75	10.95	.29 (.32)

Note. $N = 744$. Scores are based on non-K-corrected T-score conversions. Values in parentheses represent K-corrected T-score descriptive statistics. Cohen's d values represent effect sizes for Clinical versus RC scale mean T-score comparisons. Those in parentheses are for K-corrected clinical versus RC scale T-score comparisons. Positive values indicate the Clinical scale is higher than the RC scale.

Internal Structure of the RC Versus Clinical Scales

Table 2 presents the intercorrelations between and among the RC scales and the non-K-corrected Clinical scales. The data presented in this table allow us to examine whether or not our findings with 18-year-olds are consistent with Tellegen et al.'s (2003) findings of (a) generally strong associations between each RC scale and its Clinical scale counterpart, (b) less saturation of the RC scales with demoralization relative to the Clinical scales, and (c) better discriminant validity as evidenced in lower RC scale intercorrelations relative to the Clinical scales.

Concerning the correlations between scale counterparts, the italicized rs in Table 2 represent these values. Excluding RC3, which now measures cynicism (with somatic items moved to RC1) and correlated –.16 with Scale 3 (Hy), the corresponding scale correlations ranged from .57 to .90. Six of the remaining seven RC scales (1, 2, 4, 7, 8, and 9) had their highest cross-correlations with their corresponding Clinical scale. RC1 demonstrated the strongest association with its Clinical scale counterpart (.90). Aside from RC3, RC4 (.67) and RC6 (.57) had the lowest correlations with their Clinical scale counterparts. RC3 and RC6 each correlated most strongly with Scales 7 (Pt) and 8 (Sc), respectively. Thus, our data drawn from a young-adult sample provide evidence of generally good convergence between the RC and Clinical scales.

The issue of whether or not the RC scales are less saturated with demoralization than their Clinical scale counterparts can be examined via inspection of the leftmost column of correlations in Table 2, which presents the correlations between RCd and the Clinical and RC scales. As can be seen, the correlations are generally larger for the Clinical scales, wherein the mean r was .60, as compared to a mean r of .54 for the RC scales. RC7 demonstrated the strongest association with RCd (.77). Although this represents an improvement over the correlation of .88 found between RCd and Clinical Scale 7 in our sample, it still indicates a high degree of overlap between the affective core of RC7 and demoralization. As did Tellegen et al. (2003), we also found a slight increase in the association between demoralization and RC9 (.42) compared to its Clinical scale counterpart (.37). Thus, although the RC scales are less saturated with this affectively laden variance, they are clearly not demoralization free.

The upper left and lower right quadrants of Table 2 present the RC and Clinical scale intercorrelations, respectively. The mean RC scale intercorrelation was .40 ($SD = .14$) as compared to .50 ($SD = .18$) for the Clinical scales, indicating that the RC scales were more distinct than their Clinical scale counterparts. Some of the largest reductions in Clinical scale intercorrelations occurred for the 7/8 (.86), 2/7 (.65), and 4/8 (.66) scale pairs, whose corresponding RC scale pair intercorrelations were .59, .41, and .43, respectively. Of the 28 intercorrelations within each scale set, 21 of the 28 (75%) RC scale correlations were lower than the corresponding correlation with the Clinical scales. All

TABLE 2.—Intercorrelations among Minnesota Multiphasic Personality Inventory–2 (MMPI–2) RC and Clinical scale T scores (Non-K corrected) for 18-year-olds.

Scale	RCd	RC1	RC2	RC3	RC4	RC6	RC7	RC8	RC9	1	2	3	4	6	7	8
RC1: Somatic Complaints	**.58**	—														
RC2: Low Positive Emotions	**.58**	.44	—													
RC3: Cynicism	.44	.33	.14	—												
RC4: Antisocial Behavior	.43	.37	.26	.25	—											
RC6: Ideas of Persecution	**.50**	.41	.29	.39	.39	—										
RC7: Dys. Neg. Emotions	**.77**	**.54**	.41	**.51**	.36	**.53**	—									
RC8: Aberrant Experiences	**.57**	.47	.22	.42	.43	**.52**	**.59**	—								
RC9: Hypomanic Activation	.42	.33	−.02	**.51**	.46	.45	**.52**	**.59**	—							
1. Hypochondriasis	**.62**	***.90***[a,b]	.49	.33	.41	.40	**.53**	.46	.35	—						
2. Depression	**.66**	**.52**	***.71***[a,b]	.16	.24	.29	.47	.22	.00	**.60**	—					
3. Hysteria	.28	**.56**[a]	.33	−.16	.22	.11	.08	.16	−.03	**.62**	.46	—				
4. Psychopathic Deviate	**.62**	.46	.44	.27	***.67***[a,b]	.47	.46	.47	.34	**.52**	**.53**	.43	—			
6. Paranoia	**.59**	.49	.42	.06	.41	***.57***[a]	**.50**	.45	.28	**.51**	**.50**	.42	**.60**	—		
7. Psychasthenia	**.88**	**.62**	**.56**	.46[b]	.42	**.54**	***.84***[a,b]	**.60**	**.51**	**.66**	**.65**	.28	**.59**	**.61**	—	
8. Schizophrenia	**.81**	**.69**	**.53**	.45	**.54**	**.62**[b]	***.75***[a]	***.74***[b]	**.54**	**.70**	**.56**	.33	**.66**	**.65**	**.86**	—
9. Hypomania	.37	.34	−.03	.41	**.52**	.43	.37	**.60**	***.71***[a,b]	.35	.02	.09	.44	.28	.42	**.55**

Note. $N = 744$ Pearson rs $> .10$ are significant at the $p < .01$ level. Correlations $\geq .50$ are presented in boldface. Convergent correlations are italicized.
[a]Highest cross correlation of each Clinical scale. [b]Highest cross correlation of each RC scale.

7 of the intercorrelations that were lower within the Clinical scales involved Scale 3 (Hy) and 9 (Ma).

Internal Structure of the RC Versus the Alternative Scales

Table 3 presents the intercorrelations between and among the RC scales, the non-K-corrected Clinical scales, and the alternative set of MMPI–2 scales. The top panel presents the intercorrelations between the RC and alternative scales. The middle panel reports the intercorrelations between the Clinical and alternative scales. The bottom panel shows the intercorrelations among the alternative scales. The italicized *r*s along the diagonal in the top panel are the correlations between each RC scale and alternative scale pairs. With the exception of the RC4/ASP pair, each scale pair member is the highest cross-scale correlate of the other. The correlations between RCd and A (.91) and between RC1 and HEA (.90) suggest a high degree of redundancy between these scale pairs. However, five of the eight intercorrelations are below .80, with two of those below .70 (the latter reflecting <50% shared variance). Thus, the alternative scales cannot be viewed as stand-ins for the RC scales.

Sellbom, Ben-Porath, and Graham (2006) did not report the intercorrelations between the alternative set scales and their corresponding Clinical scale, which would have allowed a head-to-head comparison of how well the alternate scale set captures the core of the Clinical scales relative to the RC scales. We report these intercorrelations on the diagonal in the middle panel of Table 3. These intercorrelations are generally comparable to those reported on the diagonal in Table 2 for the RC–Clinical scale comparisons with two exceptions. The ASP/4 intercorrelation (.41) is much lower than the RC/4 intercorrelation (.67; see Table 2). However, the Pa1/6 intercorrelation (.70) exceeds that found for RC6/6 (.57; see Table 2). Thus, the RC and alternative scales are relatively comparable as markers for the original Clinical scales.

The mean intercorrelation among the alternative set scales, computed from the data reported in the bottom panel of Table 3, was .38 ($SD = .17$), slightly lower than the mean intercorrelations reported for the RC scales above (.40) and considerably lower than the findings for the Clinical scales reported earlier (.50) in the discussion of Table 2 on p. 84. The mean correlation between the alternative scales and RCd was .53 ($SD = .13$). When A is used as a substitute for RCd, its mean correlation with the RC, Clinical, and alternate scales is .57, .58, and .56, respectively, whereas RCd demonstrates the following mean correlations with these scale sets: .54, .60, and .53, respectively, suggesting that the latter is comparable to A in extracting the demoralization component from the RC, Clinical, and alternate set scales.

Convergent and Discriminant Correlations Between RC, Clinical, and Alternate Scales and Extratest Measures

Table 4 presents the head-to-head convergent and discriminant validity correlations for each RC scale, along with its Clinical and alternate scale counterparts, in relation to the subscales of the SCL–90–R. All coefficients $\geq .50$ appear in bold and expected convergent correlations are italicized. The number of items in each scale appears in parentheses next to its symbol. Beginning with the RCd/A comparison, the pattern of correlations is virtually identical, with no difference between coefficients greater than |.05|. Thus, each first-factor marker shows the same pattern of intercorrelations with the SCL–90–R subscales.

Concerning the RC1/1/HEA comparison, all three measures are most strongly correlated (.65–.67) with somatization. The pattern of their remaining discriminant validity coefficients is very similar, with no difference between coefficients greater than |.04|. The RC2/2/INTR comparison reveals that Clinical Scale 2 correlates most strongly with depression (.57) followed by RC2 (.50), with INTR showing only a .38 association with this extratest indicator. However, RC2 demonstrates a slightly clearer pattern of discriminant validity coefficients relative to Scale 2. INTR had the clearest pattern of discriminant correlations among the three measures, although it had the weakest convergent correlation with depression.

RC3 had no clear-cut convergent indicator among the SCL–90–R subscales. However, we would expect it to be most strongly associated with Paranoid Ideation and it was, showing a slightly larger association (.39) with this SCL–90–R subscale

TABLE 3.—Intercorrelations among Minnesota Multiphasic Personality Inventory–2 (MMPI–2) Restructured Clinical (RC), Clinical scale (Non-K corrected), and alternative scale T scores for 18-year-olds.

Scale	A	HEA	INTR	CYN	ASP	Pa1	NEGE	BIZ	Ma2
RCd: Demoralization	**.91**	**.59**	**.50**	.43	.43	**.58**	**.76**	**.60**	.36
RC1: Somatic Complaints	**.57**	***.90***[a,b]	.33	.31	.30	.47	**.56**	.48	.35
RC2: Low Positive Emotions	**.51**	.45	***.78***[a,b]	.12	.17	.28	.42	.27	−.07
RC3: Cynicism	**.51**	.34	.11	***.70***[a,b]	**.64**[b]	.37	.47	.44	.34
RC4: Antisocial Behavior	.40	.41	.19	.21	***.56***[a]	.40	.40	.44	.36
RC6: Ideas of Persecution	**.55**	.42	.21	.42	.43	***.77***[a,b]	**.52**	**.72**	.31
RC7: Dysfunctional Negative Emotions	**.88**	**.54**	.32	.47	.46	**.56**	***.86***[a,b]	**.64**	.38
RC8: Aberrant Experiences	**.62**	**.50**	.14	.43	.47	**.54**	**.56**	***.89***[a,b]	.49
RC9: Hypomanic Activation	**.51**	.36	−.16	**.50**	**.60**	.46	**.53**	**.56**	***.67***[a,b]
1. Hypochondriasis	**.58**	***.91***[c,d]	.36	.33	.32	.47	**.57**	.46	.34
2. Depression	**.59**	**.55**	**.68**[c,d]	.17	.12	.36	**.51**	.27	.05
3. Hysteria	.16	**.56**[c]	.25	*−.10*	−.09	.17	.17	.15	.10
4. Psychopathic Deviate	**.56**	.49	.41	.25	*.41*	**.56**[c]	**.56**[c]	**.51**	.27
6. Paranoia	**.57**	**.51**	.35	.11	.16	***.70***[c,d]	**.57**	**.55**	.20
7. Psychasthenia	**.91**	**.65**	**.46**	.45[d]	.45	**.59**	***.80***[c,d]	**.64**	**.43**
8. Schizophrenia	**.83**	**.71**	.44	.45[d]	**.52**	**.68**	**.71**	***.75***[c,d]	.47
9. Hypomania	.40	.35	−.10	.41	**.56**[d]	.47	.35	.52	***71***[c,d]
A: Anxiety		**.57**	.43	.49	.47	**.61**	**.83**	**.66**	.40
HEA: Health Concerns			.32	.32	.32	.49	**.57**	.51	.34
INTR: Introversion/Low Positive Emotion				.07	.10	.22	.34	.19	−.13
CYN: Cynicism					**.55**	.39	.40	.44	.36
ASP: Antisocial Practices						.41	.43	.48	.39
Pa1: Persecutory Ideas							**.59**	**.69**	.33
NEGE: Neuroticism/Negative Emotion								**.59**	.38
BIZ: Bizarre Mentation									.45
Ma2: Psychomotor Acceleration									

Note. $N = 744$. Pearson rs $> .10$ are significant at the $p < .01$ level. Correlations $\geq .50$ are presented in boldface. Convergent correlations are italicized.
[a]Highest cross correlation of each RC scale with alternate set scales. [b]Highest cross correlation of each alternate scale with RC scales. [c]Highest cross correlation of each clinical scale with alternate set scales. [d]Highest cross correlation of each alternate set scale with clinical scales.

TABLE 4.—Head-to-head Convergent and discriminant correlations between Restructured Clinical (RC), Clinical, and alternate Minnesota Multiphasic Personality Inventory–2 (MMPI–2) scales and SCL–90–R subscales.

Scale (No. Items)	Somatiziation	Depression	Hostility	Paranoid Ideation	Obsessive–Compulsive	Anxiety	Phobic Anxiety	Psychoticism	Interpersonal Sensitivity
RCd (24)	**.52**	**.72**	.48	**.55**	**.67**	**.61**	.45	**.58**	**.66**
A (39)	**.52**	**.71**	**.51**	**.60**	**.70**	**.63**	.46	**.60**	**.68**
RC1 (26)	***.66***	**.57**	.46	**.50**	**.55**	**.57**	.36	**.50**	**.50**
1 (32)	**.65**	**.59**	.48	**.51**	**.58**	**.56**	.36	**.50**	**.52**
HEA (36)	***.67***	**.55**	.46	**.51**	**.55**	**.55**	.37	**.50**	**.50**
RC2 (17)	.41	***.50***	.33	.32	.43	.38	.30	.35	.47
2 (57)	.48	***.57***	.35	.37	**.54**	.46	.34	.43	.49
INTR (34)	.32	*.38*	.27	.21	.33	.31	.30	.27	.35
RC3 (15)	.22	.26	.25	.39	.29	.22	.17	.27	.29
3 (59)	**.52**	.38	.25	.22	.29	.36	.20	.29	.25
CYN (23)	.24	.27	.21	.32	.28	.24	.13	.30	.23
RC4 (22)	.32	.34	*.41*	.36	.32	.30	.24	.30	.36
4 (49)	.45	.40	*.41*	.48	.46	.41	.32	.42	.49
ASP (22)	.24	.31	*.36*	.41	.34	.29	.24	.30	.33
RC6 (17)	.42	.45	.45	***.53***	.44	.43	.36	.43	.45
6 (40)	.49	**.53**	.44	*.46*	.47	**.51**	.39	.44	**.50**
Pa1 (17)	.46	**.50**	.45	***.58***	**.50**	.47	.36	.46	.48
RC7 (24)	.48	**.63**	**.53**	**.57**	***.65***	***.59***	*.48*	**.54**	**.63**
7 (48)	**.59**	**.72**	**.52**	**.59**	***.72***	***.67***	***.50***	**.61**	**.67**
NEGE (33)	**.52**	**.65**	**.54**	**.55**	***.62***	***.60***	*.45*	**.51**	**.63**
RC8 (18)	.44	.42	.40	.46	.44	.45	.35	*.44*	.37
8 (78)	**.57**	**.62**	**.51**	**.58**	**.64**	**.59**	.42	***.54***	**.59**
BIZ (23)	.46	.47	.43	**.52**	.49	.49	.40	*.47*	.44
RC9 (28)	.30	.33	.38	.43	.35	.38	.24	.33	.33
9 (46)	.27	.27	.34	.39	.31	.31	.21	.31	.25
Ma2 (11)	.26	.28	.24	.31	.31	.35	.18	.27	.22

Note. SCL–90–R = Symptom Checklist–90–Revised. *N*s range from 325 to 333 due to missing data precluding computation of some SCL–90–R subscale scores for some participants. Correlations reflecting large effect sizes (≥.50) are presented in boldface. The most conceptually relevant convergent *r*s are italicized.

than did either Scale 3 (.22) or CYN (.32). Its pattern of discriminant correlations was comparable to that of CYN and Scale 3 for five of the discriminant criterion measures. However, Scale 3 correlated strongly with somatization as expected. Moreover, RC3 and CYN were less associated with depression and anxiety than was Scale 3. Thus, RC3 and CYN held a slight advantage over Scale 3 in their patterns of discriminant correlations. We predicted hostility to be the nearest convergent correlate of RC4, and it was. RC4 was less correlated with the remaining discriminant measures when compared to Scale 4 and demonstrated a discriminant correlation pattern comparable to that observed for ASP. As we expected, RC6 was most strongly associated with the Paranoid Ideation subscale of the SCL–90–R (.53), a magnitude of association slightly higher than that observed for Scale 6 (.46). Pa1 demonstrated the strongest association with this subscale (.58). However, RC6 had improved discriminant correlations when compared to Scale 6 and Pa1, although the magnitude of differences was slight.

Concerning the measurement of the neuroticism/negative emotional experiences construct, we would expect the competing measures, RC7/7/NEGE, to be most strongly associated with the anxiety indexes of the SCL–90–R, including the Obsessive–Compulsive, Anxiety, and Phobic Anxiety subscales. Scale 7 had the largest mean correlation (.63) with these subscales followed by RC7 (.57) and NEGE (.56). Although comparable, RC7 and NEGE demonstrated slightly lower discriminant validity correlations relative to Scale 7. Scale 8 demonstrated the strongest convergent association with psychoticism (.54) followed by BIZ (.47) and RC8 (.44). The discriminant validity of RC8 was slightly favored over BIZ, which demonstrated a clearer pattern of discriminant correlations relative to Scale 8. Because no SCL–90–R subscale qualifies as a good convergent indicator for hypomanic activation, the correlations with SCL–90–R subscales can only reveal the discriminant validity of RC9, Scale 9, and Ma2. Reflecting its superior discriminant validity, Ma2 had the lowest correlations with these subscales followed by Scale 9. RC9 demonstrated the highest correlations across the SCL–90–R subscales. However, these discriminant correlations were still among the lowest of any RC scale.

Overall, our data reveal that the RC scales held a slight advantage over the Clinical scales when we examined their respective patterns of discriminant correlations with the subscales of the SCL–90–R. Moreover, the pattern of discriminant correlations indicated a slight advantage for the RC scales over the scales in the alternative set, with the notable exception of the poorer discriminant validity of RC9 relative to both Ma2 and Scale 9.

Comparison of RC Versus Clinical Scale Profile Elevation Status

Table 5 presents the findings concerning the comparative profile elevation of participants when either the RC or the Clinical scales are used to determine profile elevation status. RCd scores were included in the determination of RC scale profile elevation status. A profile was considered clinically elevated if at least one of the scale set's T scores had a T score $\geq$ 65. The left column of data of Table 5 compares RC scale elevation status to Clinical scale elevation status when non-K-corrected T scores are used. The right column of data compares RC scale elevation status to Clinical scale elevation status using K correction as is done in most clinical settings. The top panel of Table 5 displays the findings for all participants. As can be seen, the rate of concordance in clinical elevation status between the RC scales and Clinical scales when no K correction was used was 79.4%. Concordance in profile elevation was slightly lower when K correction was used for the Clinical scales (75.0%).

TABLE 5.—Comparison of Restructured Clinical (RC) and Clinical scale profile elevation status in 18-year-olds.

Sample	RC/Clinical (non-K)	RC/Clinical (K-corrected)
All participants ($N = 744$)		
Neither profile elevated	262 (35.2%)	226 (30.4%)
RC elevated/ Clinical WNL	86 (11.6%)	83 (11.2%)
RC WNL/Clinical elevated	67 (9.0%)	103 (13.8%)
Both profiles elevated	329 (44.2%)	332 (44.6%)
Psychopathology absent on GSI ($N = 238$)		
Neither profile elevated	107 (45.0%)	122 (51.3%)
RC elevated/ Clinical WNL	26 (10.9%)	32 (13.4%)
RC WNL/Clinical elevated	39 (16.4%)	24 (10.1%)
Both profiles elevated	66 (27.7%)	60 (25.2%)
Psychopathology present on GSI ($N = 79$)		
Neither profile elevated	5 (6.3%)	7 (8.9%)
RC elevated/ Clinical WNL	8 (10.1%)	6 (7.6%)
RC WNL/Clinical elevated	5 (6.3%)	3 (3.8%)
Both profiles elevated	61 (77.2%)	63 (79.7%)

Note: WNL = within normal limits. GSI = Global Severity Index. A profile was considered elevated if at least one scale T-score was $\geq$65. RCd is included in the determination of RC Scale elevation status. Participants with incomplete Symptom Checklist-90-Revised protocols (16) were excluded from the analyses using the GSI criterion measure. Some columns do not add to 100% due to rounding.

The middle and lower panels of Table 5 present the findings for participants judged to be psychopathology absent (PA) versus those judged to be PP using the GSI of the SCL–90–R as the criterion. The number of participants classified as psychopathology present (PP) ($N = 79$) represents 24.9% of those who provided complete SCL–90–R data ($N = 317$). This rate of disorder is in line with epidemiological data suggesting that 25% to 40% of individuals in mid to late adolescence suffer from some mental disorder (Kessler et. al, 1994; Newman et al., 1996; Robbins & Rieger, 1991). Consequently, it appears that the collateral measure of psychopathology used in this study was successful in screening individuals for the presence of significant psychopathology.

The profile comparisons presented in the middle panel of Table 5 for PA participants reveal rates of agreement in clinical elevation status between the RC and Clinical scales of 72.7% and 76.5% for non-K and K-corrected profiles, respectively. For participants with discordant profile elevation status, the RC scales correctly identified slightly more PA participants than the Clinical scales when no K correction was employed. The lower panel reveals even greater concordance in profile elevation status between the RC and Clinical scales for participants judged to be PP based on their GSI scores. Concordance rates were 83.5% and 88.6% for non-K and K-corrected profiles, respectively.

The data reported in Table 5 also allow us to examine the respective rates of WNL profiles in our sample. Rogers et al. (2006) found WNL rates greater than 40%, with corresponding rates for the Clinical scales at 10% lower. Although Rogers et al. referred to their sample as comprised of clinically referred cases, Tellegen et al. (2006) disputed this and suggested the Rogers et al. sample included many preemployment and forensic cases that would pull for defensive responding. We expected lower

rates of WNL responding within the PP segment of our college student sample, which was screened for defensive responding. This expectation was confirmed. Overall, the rate of WNL RC scale profiles in our entire sample was 44.2% as compared to 46.8% and 41.6% for the non-K-corrected and K-corrected Clinical scales, respectively. Within the PA subsample, the RC scale WNL rate was 61.4% as compared to 55.9% and 64.7% for the non-K-corrected and K-corrected Clinical scales, respectively. Within the PP subsample, the rate of WNL RC scale profiles was 12.6% as compared to 16.4% and 16.5% for the non-K-corrected and K-corrected Clinical scales, respectively.

Thus, RC and Clinical scale profile elevation status is concordant 73% to 89% of the time depending on which subsample is under consideration and whether or not K correction is used for the Clinical scales. Our data also reveal that WNL rates are generally comparable between the RC and Clinical scales and are reasonably low in conditions in which other measures suggest the presence of psychopathology.

Comparison of M8 and Mean RC Scale T-Score Indexes

In light of Graham et al.'s (2002) finding that the mean Clinical scale T score (M8) serves as the best indicator of general maladjustment, we examined RC scale-based measures of this index. One could argue that mean RC scale scores either including or excluding RCd would be most appropriate to use. We computed mean RC scale score each way and found the two indexes to be highly correlated ($r = .99$), with each RC-based index correlating .71 with M8. Descriptive statistics for M8 and mean RC scale score (computed each way) are displayed in Table 6. Paired sample t tests of the difference between each RC-based index and M8 were both significant (ps $< .001$). Each mean RC indicator was lower than M8 but by less than 1 T-score point, yielding only negligible effect sizes (ds $= .10$).

Comparison of the Diagnostic Efficiency Statistics of RC and Clinical Scale Profile Elevation Indicators

A key research question we addressed is how measures of clinical elevation status based on the RC scales would perform relative to those based on the original Clinical scales when matched against an independent criterion of maladjustment. Thus, we compared the diagnostic efficiency statistics of RC scale-based indexes of profile elevation to those based on the clinical scales when predicting to the SCL–90–R's GSI. In keeping with the Standards for Reporting of Diagnostic Accuracy (STARD) initiative and the editorial recommendations of this journal (Meyer, 2003), we present a STARD flowchart for the five indexes used to determine profile elevation (see Figure 1).

Table 7 presents data concerning the diagnostic efficiency statistics of the K-corrected and non-K-corrected Clinical scales along with those for the RC scales. Data are presented for the

TABLE 6.—Descriptive statistics for Graham, Barthlow, Stein, Ben-Porath, and McNulty's (2002) M8 measure of clinical elevation when computed from the Clinical versus Restructured Clinical (RC) scales in 18-year-olds.

Scale	*M* (*SD*)	Skewness	Kurtosis
M8	55.00 (8.45)	.85	.89
Mean RC including RCd	54.18 (7.66)	.44	.00
Mean RC excluding RCd	54.15 (7.75)	.47	.03

Note. ($N = 744$).

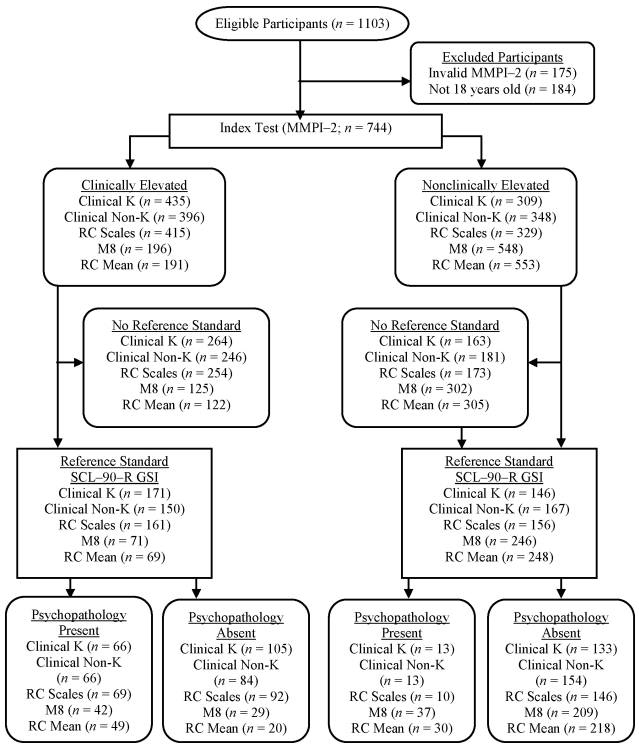

FIGURE 1.—Standards for Reporting of Diagnostic Accuracy flowchart for the Minnesota Multiphasic Personality Inventory–2 (MMPI–2) Restructured Clinical (RC) scales. M8 = Graham, Barthlow, Stein, Ben-Porath, and McNulty's (2002) eight Clinical scales; SCL–9–R = Symptom Checklist–90–Revised; GSI = Global Severity Index.

M8 and Mean RC scale indexes of profile elevation as well. A sample optimized, T $\geq$ 59, cutoff was used for both of the latter measures, as this cut score yielded the best hit rate for each mean scale elevation measure when compared to other cut scores. When comparing diagnostic efficiency statistics for the Clinical scales, RC scales, and the Clinical and mean RC scale T-score indexes, one must bear in mind that the sample optimized cut scores used for the latter measures hold an advantage over the fixed cut scores used in the former measures. Data from the Osberg and Poland (2002) study are presented as well in Table 7 for comparison sake, although we note that they eliminated participants with borderline GSI scores from their analyses.

As can be seen, clinical elevation status on the RC scales, when compared to the GSI as a general maladjustment criterion, yielded diagnostic efficiency statistics comparable to those observed for the Clinical scales whether or not K correction was used. However, the use of mean RC scale T-score index (with a T $\geq$ 59 cutoff) yielded improved diagnostic efficiency statistics. The mean RC scale T-score index (which includes RCd) yielded a hit rate of 84.23% when matched to the GSI general maladjustment criterion. Specificity (91.60%) and positive predictive power (71.01%) were improved relative to the RC scale-based (61.34% and 42.86%, respectively) and the Clinical scale-based indexes (55.88% and 38.60%, K corrected, and 64.71% and 44.00%, non-K corrected, respectively) and improved on those yielded by the M8 index of maladjustment (87.82% and 59.15%, respectively). The sensitivity of the Mean RC scale index was

TABLE 7.—Comparison of the diagnostic efficiency statistics for various Minnesota Multiphasic Personality Inventory–2 (MMPI–2) Clinical versus Restructured Clinical (RC) scale measures of profile elevation in relation to SCL–90–R psychopathology status.

Statistic	Clinical Scales	Clinical Non-K	RC Scales	M8 ≥ 59[a]	*M* RC ≥ 59[a]	MMPI–A[b]
Hit rate	62.78 (60.00)[c]	69.40	67.82	79.18	84.23 (82.97)[d]	78.00
Sensitivity	83.54 (82.93)	83.54	87.34	53.16	62.03 (59.49)	53.65
Specificity	55.88 (44.07)	64.71	61.34	87.82	91.60 (90.76)	94.92
Positive predictive power	38.60 (50.75)	44.00	42.86	59.15	71.01 (68.12)	88.00
Negative predictive power	91.10 (78.79)	92.22	93.59	84.96	87.90 (87.10)	74.67

Note. $n = 317$. MMPI–A = MMPI–Adolescent. The criterion of at least one scale T score ≥ 65 was used to determine profile elevation for the Clinical scales, non-K-corrected Clinical scales, and the RC scales. Definitions of the various diagnostic efficiency statistics assessed, adapted from Streiner (2003), are given following: *Hit rate* = the proportion of correctly identified cases (true clinical + true normal) divided by the total number of cases. *Sensitivity* = the proportion of people who have a disorder who are correctly detected by the test. *Specificity* = the proportion of people without a disorder who are correctly labeled by the test. *Positive predictive power* = the proportion of individuals identified by an elevated test score who actually have a disorder. *Negative predictive power* = the proportion of individuals who do not have an elevated test score who actually do not have a disorder.
[a]The cut scores for M8 and mean RC scale T score reflect sample optimized cut scores. The cut scores for each measure were chosen on the basis of having superior hit rates to other cut scores. The optimal cut score for each measure was 59. [b]For comparison, the values given for the MMPI–A are those obtained on a sample of 18-year-olds ($N = 100$) by Osberg and Poland (2002). [c]For comparison, the values given for Clinical scales in parentheses are those obtained on a sample of 18-year-olds ($N = 100$) by Osberg and Poland (2002). [d]Values given for mean RC in parentheses are those obtained when RCd was excluded.

still somewhat low (62.03%) but improved on the MMPI–A's sensitivity (53.65%). The MMPI–A had yielded the best overall diagnostic efficiency statistics in the Osberg and Poland (2002) study despite its modest sensitivity. Sensitivity was greatest for the traditional Clinical scale-based and RC scale-based measures of profile elevation, ranging from 83.54% to 87.34%. All measures employed in this study had generally high negative predictive power, ranging from 84.96% to 93.59%.

Last, by comparing the mean number of elevations on the RC versus the Clinical scales in the PP subsample, we were able to assess whether or not the RC scales provide a more discriminant assessment of psychopathology when it is present. With the removal of demoralization, we expected the mean number of RC scale elevations to be exceeded by that of the Clinical scales. This expectation was confirmed. The mean number of RC scales elevated in the PP group was 2.81 ($SD = 2.08$) as compared to an average of 3.32 ($SD = 2.52$) for the non-K-corrected Clinical scales, $t(79) = 2.46$, $p < .02$, $d = –.21$. However, only a negligible difference in the expected direction was observed when the mean number of elevated RC scales ($M = 2.81$, $SD = 2.08$) was compared to that of the K-corrected Clinical scales ($M = 3.14$, $SD = 2.46$), which failed to reach statistical significance ($p > .17$, $d = –.12$).

DISCUSSION

In this study, we sought to provide an independent evaluation of the RC scales of the MMPI–2 (Tellegen et al., 2003) within a large sample of 18-year-old young adults, a population known to be overpathologized by the original Clinical scales (e.g., Butcher, Graham, Dahlstrom et al., 1990; Osberg & Poland, 2002; Shaevel & Archer, 1996). In the first study to do so, we were able to compare the profile elevation status of participants based on the RC and Clinical scales and determine the comparative diagnostic efficiency statistics of indexes of profile elevation based on the RC versus the Clinical scales relative to an independent criterion of psychopathology status. In addition, we explored the internal structure and extratest correlates of the RC scales relative to the Clinical scales and an alternative set of scales thought to be comparable to the RC scales (Nichols, 2006b). Overall, our findings suggest that Tellegen et al. (2003) were successful in deriving a set of scales that effectively assess the clinical constructs they target while producing a scale set whose traditional index of profile elevation (i.e., having at least one scale T score ≥ 65) shows diagnostic efficiency statistics comparable to the Clinical scales.

The data we present for 18-year-old college students largely replicate those of Tellegen et al. (2003) and others (Sellbom, Ben-Porath, & Graham, 2006; Simms et al., 2005; Tellegen et al., 2003, Wallace & Liljequist, 2005) concerning the improved internal structure of the RC scales relative to the Clinical scales. Among 18-year-olds, the RC scales were less intercorrelated than were the Clinical scales and generally had their corresponding Clinical scale as their strongest cross correlation. The greatest reduction in scale intercorrelations occurred for the 7/8, 2/7, and 4/8 scale pairs. RC3 and RC9 accounted for all instances wherein scale intercorrelations had increased relative to the Clinical scales. The RC scales also were less strongly associated with demoralization (as measured by RCd) compared to the Clinical scales, although they were not entirely free of demoralization. On the whole, the foregoing pattern of findings was largely consistent with what others have found within varying samples (Sellbom Ben-Porath, & Graham , 2006; Simms et al., 2005; Tellegen et al., 2003, Wallace & Liljequist, 2005), suggesting that these scales are more distinctive than the Clinical scales and capture the clinical constructs Tellegen et al. (2003) had intended.

Our data also bear on Nichols' (2006b) concerns that existing MMPI–2 scales could serve equally well as stand-ins for the RC scales. We examined the internal structure of the alternate set of scales culled from the Content, Harris–Lingoes, and PSY–5 scales (A, HEA, INTR, CYN, ASP, Pa1, NEGE, BIZ, Ma2) that Nichols (2006b) suggested as being comparable to the RC scales and that were examined in relation to the RC scales by Sellbom Ben-Porath, and Graham (2006). We found that these alternate scales demonstrated convergent correlations with the Clinical scales that were of a similar magnitude to those obtained for the RC scales and had comparable internal structure to that observed for the RC scales.

Although we did not have extensive extratest data available to us, we were able to explore the associations between the RC scales, the Clinical scales, and the alternate scales in relation to the subscales of the SCL–90–R. The overall pattern of findings reflected a slight advantage of the RC scales over the Clinical scales with reference to discriminant validity. Moreover, the RC scales held a slight edge over the alternate set of existing MMPI–2 scales proposed by Nichols (2006b) while using fewer

items than comprise this alternative scale set. The findings for RC9 reflected weaker discriminant validity than its Clinical and alternate scale counterparts and consistent with Rogers et al.'s (2006) conclusions, we suggest that further work in refining this scale is necessary.

Our data concerning the comparative elevation of the RC and Clinical scales revealed a pattern of findings consistent with previous research on the RC scales in diverse samples (Sellbom, Ben-Porath, & Graham, 2006; Simms et al., 2005; Tellegen et al., 2003, Wallace & Liljequist, 2005). We found the RC scales produced generally lower elevations on a scale-by-scale basis for our participants when compared to the Clinical scales. Despite this, the rate of agreement in clinical elevation for the RC and Clinical scales for all participants (with and without K correction) approached 80%, suggesting a reasonable degree of comparability across these scale sets. Among participants judged to have significant psychopathological symptoms on the SCL–90–R, the rate of agreement averaged 86%. Thus, the isolation of the demoralization factor appears to have lowered the elevation of the Clinical scales most infused with this dimension while producing profiles of an overall elevation that were generally comparable to the elevation of the Clinical scales.

Although we focused on comparing Clinical and RC scale profile elevations, disparities in the elevation of individual Clinical and RC scale pairs (e.g., 1/RC1) are also likely to be of interest to researchers and clinicians. Sellbom, Ben-Porath, McNulty, Arbisi, and Graham (2006) pointed out that such differences may occur for several possible reasons including differences in the influence of demoralization, K correction, and subtle items that exist between the two scale sets. Sellbom, Ben-Porath, McNulty, et al. provided researchers and clinicians with a useful set of procedures for identifying which of these factors may best account for observed scale-by-scale differences, and they set forth guidelines concerning when RC scale elevations are especially likely to aid the interpretation of the Clinical scales.

The data we present concerning the rate of WNL profiles in our sample speak to the concerns raised by Rogers et al. (2006). Rogers et al. found rates of WNL profiles exceeding 40% in the large clinical sample they studied. Tellegen et al. (2006) explained that this was possibly due to the inclusion of cases wherein an "accentuate the positive" test-taking attitude was likely to occur (e.g., child custody evaluation and personnel selection cases). Across our entire heterogeneous sample of college students, 44% produced a WNL profile on the RC scales as compared to 47% on the Clinical scales (without K correction). Of course, the portion of students identified as psychopathology present using the SCL–90–R criterion we employed offers the most direct comparison to the Rogers et al. data for clinical cases. Within this subsample of 18-year-olds, we found only a 13% rate of WNL profiles, a rate slightly less than that obtained for the Clinical scales (16%). Thus, our data do not reveal any tendency for the RC scales to produce an inflated percentage of WNL profiles, especially among individuals who likely have significant psychopathological symptoms present.

The profile elevation data we present for this young adult sample also bear on the overpathologizing issue raised in previous research (Butcher, Graham, Dahlstrom, et al., 1990; Osberg & Poland, 2002; Shaevel & Archer, 1996). More than 50% of our full sample obtained an elevated MMPI–2 profile whether or not the Clinical or RC scales were used in determining profile elevation status. Even among participants considered psychopathology absent on the SCL–90–R GSI, 35% to 44% were considered clinically elevated on the MMPI–2 depending on which scale set was used. However, given the epidemiological data cited earlier concerning high rates of psychological disorders in young adults (Kessler et al., 1994; Newman et al., 1996; Robbins & Rieger, 1991) and recent evidence that the frequency and severity of psychological disorders among college students are on the rise (Benton, Robertson, Tseng, Newton, & Benton, 2003), these findings may reflect developmental differences between late adolescence and adulthood in the experience of psychopathological symptoms. Moreover, findings we turn to next suggest that some MMPI–2 indicators of profile elevation perform well in detecting the absence of significant psychopathology.

We examined the diagnostic efficiency statistics of measures of profile elevation based on the RC and Clinical scales in relation to participants' PA versus PP status using the SCL–90–R's GSI as a criterion. Our findings (see Table 7) revealed that the traditional index of profile elevation (i.e., having at least one scale T score $\geq$ 65) based on the RC scales had diagnostic efficiency statistics comparable to those obtained for the Clinical scales whether or not K correction was used. However, the best overall performance in diagnostic efficiency statistics was observed when using the mean RC scale T-scale score, a variant of Graham et al.'s (2002) M8, as an index of general maladjustment (with a T $\geq$ 59 cutoff). The hit rate for this index was 84%. The mean RC scale index did have modest sensitivity (62%), which still outperformed that observed for the MMPI–A within this age group (see Table 7) by Osberg and Poland (2002). The mean RC scale index had the best combination of specificity, positive predictive power, and negative predictive power (92%, 71%, and 88%, respectively) among the measures studied.

The superior specificity of the mean RC scale index is important in light of the previously cited findings concerning the Clinical scales' overpathologizing of younger respondents. When matched to the GSI as a criterion measure, this index correctly identified more than 90% of participants judged to be free of significant pathological symptoms on this criterion. As Streiner (2003) pointed out, once a test is put into general use, positive and negative predictive power become of primary concern. The positive predictive power of the mean RC scale index was superior to that derived from all other indexes of profile elevation examined in this study, with more than 70% of participants identified as elevated on this index having also been considered elevated on the criterion measure.

The findings concerning the superiority of the mean RC scale index and its corresponding Clinical scale counterpart M8 must be tempered by the recognition that sample optimized cut scores have an inherent advantage over fixed cut scores such as the T $\geq$ 65 employed in determining clinical elevation status for the Clinical and RC scales. It will be for future research to determine whether or not a fixed cut score for the mean RC index that yields improved diagnostic efficiency can be identified for use across a broad range of populations. It is also important to point out that diagnostic efficiency measures such as sensitivity and specificity are determined by the cutoff score chosen and that these two indicators bear a reciprocal relationship to each other: As one increases, the other deceases (Streiner, 2003).

This study is not without its limitations. We used a self-report symptom checklist as the criterion measure of the existence of significant psychopathological symptoms among the participant

subsample used to explore the diagnostic efficiency statistics of the RC scales. Critics might argue that a more extensive structured interview would have been a more appropriate criterion measure. However, such interviews are most useful in fleshing out differential diagnoses, and we simply needed an efficient assessment of the presence or absence of significant psychopathological symptoms in our participants. Moreover, the measure we employed has been used extensively as such a criterion measure in past research (e.g., Brophy et al., 1988; Graham et al., 2002; Osberg & Poland, 2002; see Derogatis, 1993, for a bibliography). Also, the rate of individuals having significant psychopathological symptoms identified using this criterion measure was consistent with rates obtained in recent epidemiological studies of similarly aged individuals (Kessler et al., 1994; Newman et al. 1996; Robbins & Rieger, 1991). In addition, given the narrow age group we studied, our findings concerning the accuracy of Clinical and RC scale-based measures of profile elevation in identifying significant psychopathology must be replicated using other age groups and samples with diverse demographic characteristics.

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