Joint Factor Structure of the Multidimensional Personality Questionnaire and the MMPI in a Psychiatric and High-Risk Sample

David L. DiLalla, Irving I. Gottesman, Gregory Carey, and George P. Vogler

This study assessed aspects of the construct validity of the Multidimensional Personality Questionnaire (MPQ), a measure of normal personality characteristics, in a clinically relevant sample through joint factor analyses of primary and second-order scales of the MPQ and the Minnesota Multiphasic Personality Inventory (MMPI). A subsample from the Washington University Twin Study of Psychopathology was analyzed. The MPQ's primary scales and higher order factors were found to have meaningful associations with MMPI scales that served as construct markers. The MPQ taps constructs related to, although not redundant with, those measured by the MMPI. Additionally, the MPQ provides a Constrain measure that is relevant to the study of psychopathy and not represented among the MMPI clinical scales. The potential utility of the MPQ in clinical settings as an adjunct to traditional assessment instruments such as the MMPI is discussed.

Objective evaluation of personality in clinical settings traditionally has been accomplished using instruments that yield information relevant to diagnosis and treatment of psychological disorders, such as the Minnesota Multiphasic Personality Inventory (MMPI; Dahlstrom, Welsh, & Dahlstrom, 1972). Conversely, the bulk of research on development and stability of normal personality characteristics has drawn on tests that do not purport to assess psychopathology directly, such as the 16PF (Cattell, Eber, & Tatsuoka, 1970), the NEO Personality Inventory (Costa & McCrae, 1985), the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975), and the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982; Tellegen, in press).

Recent theoretical and empirical work that conceptualizes psychopathology as the extreme expression of thoughts, behaviors, and emotions that exist along a continuum suggests that normal personality measures might fruitfully be applied to psychological evaluation in clinical settings. Research has linked high levels of neuroticism with the experience of emotional distress and psychopathology (Eysenck, 1970; Eysenck & Eysenck, 1976; Slater, 1943; Slater & Slater, 1944; Tellegen, 1985). Individuals who score significantly higher than average on Neuroticism or Negative Affectivity (Watson & Clark, 1984) tend to be poorly adjusted, pervasively distressed, anxious, guilty, and dissatisfied with their lives. Neuroticism is reflected strongly in the associations among the MMPI's clinical and validity scales (Eichman, 1961; Welsh, 1956). Normal personality measures that provide a wider lens on the Neuroticism domain may also yield valuable clinical information, however, particularly in cases in which psychopathology is less severe.

Eysenck (1953, 1970, 1987) also suggested an influential role for psychotism in the development of psychopathology, arguing that eccentricities of thought and behavior observed in nonpsychotic relatives of psychotic patients reflected subclinical expression of psychotism. Others, however (John, 1989; Zuckerman, Kuhlman, & Camac, 1988), have noted that psychotism better reflects an amalgam of the Big Five traits of Agreeableness and Conscientiousness and may relate to sociopathy.

The relevance of normal personality inventories to clinical assessment is clearer in the realm of personality disorders. Recent research has highlighted diagnostic (Blashfield & Breen, 1989; Widiger, Frances, Warner, & Bluhm, 1986) and behavioral (Clark, 1990; Widiger, 1991; Widiger, Freiman, & Bailey, 1990) overlap among the Axis II disorders of the DSM-III-R (Diagnostic and Statistical Manual of Mental Disorders, 3rd ed., rev; American Psychiatric Association, 1987), prompting a call for the institution of a dimensional approach to classifying deviant personality styles (Cloninger, 1987; Costa & McCrae, 1990; Groth & Tellegen, 1991; Millon, 1981; Powell, 1984; Widiger & Frances, 1985). Under such a model, individuals are characterized not by a single diagnosis but by their relative standing on a wide range of normally distributed personality characteristics. As an instrument that taps relatively homoge-

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neous source traits as well as higher order personality domains, the MPQ is relevant to such an approach.

The findings above suggest that normal personality measures might play a significant role in clinical assessment in their own right. Additionally, such measures may have utility for assessment of individuals at risk for developing psychopathology. Moreover, given the distinctions between traditional clinical instruments and normal personality measures, the latter might provide incremental diagnostic and predictive utility when used in conjunction with the former. A review of the recent literature on alcoholism (Brooner, Templer, Svikis & Schmidt, 1990; Kuncel & Newton, 1989), as well as research in progress, reveals that a number of clinically oriented research projects have incorporated normal personality measures (Ben-Porath & Waller, 1992), including the MPQ (B. Epstein, personal communication, March 1991; E. F. Torrey, personal communication, January 1991). It is imperative that such efforts be accompanied by construct validation studies of normal personality measures in clinical samples.

Description of the MPQ

The MPQ is a 300-item factor-analytically derived self-report questionnaire. The present report is based on the MPQ’s unpublished manual (Tellegen, 1982); the instrument is currently in press (A. Tellegen, personal communication, October 1992). The MPQ’s item pool primarily is nonredundant with that of the MMPI; however, some MPQ items are nearly identical to MMPI items, and others reflect close wording of MMPI items. Development of the MPQ is described in detail by Tellegen and Waller (in press). It comprises 11 primary factor scales, 3 protocol validity scales, and 3 higher order factor scales. The primary scales are labeled Well Being (WB), Social Potency (SP), Achievement (ACH), Social Closeness (SC), Stress Reaction (SR), Alienation (AL), Aggression (AG), Control (CON), Harm Avoidance (HA), Traditionalism (TRA), and Absorption (AB).

Descriptions of the scales are presented by Tellegen and Waller (in press) and DiLalla, Gottesman, and Carey (1993). The primary scales are relatively independent ($r = .00$ to .48, $M = .16$) but allow recovery of three higher order factors: Negative Emotionality (NEM), Constraint (CO), and Positive Emotionality (PEM).

Negative Emotionality (NEM) is associated with the primary scales Stress Reaction, Alienation, Aggression, and Absorption. High scorers on NEM tend to be negatively engaged in interpersonal relationships and to experience anxiety, anger, and worry. Low scorers are less likely to experience negative emotional states and less likely to feel stressed by their day-to-day lives (Tellegen, 1982, 1985; Tellegen & Waller, in press). NEM correlates .5 with self-ratings of negative mood state (Tellegen 1982, 1985; Zevon & Tellegen, 1982), is positively correlated with EPQ Neuroticism, and is negatively correlated with CPI Value Orientation (Tellegen, 1982; Tellegen & Waller, in press).

Constraint (CO) is marked by the primary scales Control, Harm Avoidance, and Traditionalism, and is associated with self-control, avoidance of danger, and conventionality. High scorers tend to be timid, shy, avoidant, and compulsive, whereas low scorers tend toward adventurousness, lack of conventionality, and impulsivity. CO is positively correlated with CPI Rigidity and negatively correlated with Novelty-Seeking from the Tridimensional Personality Questionnaire (TPQ; Cloninger, 1987; Waller, Lilienfeld, Tellegen, & Lykken, 1991) and with EPQ Psychoticism (Tellegen, 1982; Tellegen & Waller, in press).

PEM is indexed by the primary scales Well Being, Social Potency, Social Closeness, Achievement, and Absorption (Tellegen, 1982, 1985; Tellegen & Waller, in press) and relates to a general sense of pleasurable engagement, extraversion, and well being. High scorers on PEM tend toward positive interpersonal engagements and positive mood states; low scorers lack positive emotional engagements and may have depressed mood. PEM correlates .5 with state ratings of positive mood (Tellegen, 1982, 1985; Zevon & Tellegen, 1982) and is positively associated with EPQ Extraversion and Person Orientation from the California Personality Inventory (CPI; Gough, 1975; Tellegen, 1982; Tellegen & Waller, in press).

Tellegen and Waller (in press) recently reported a four-factor model for the MPQ that complements the three-factor interpretation of the instrument. Under the four-factor model, NEM and CO are unchanged, whereas PEM is subdivided into Affective Positive Emotionality (PEM-A) and Communal Positive Emotionality (PEM-C). PEM-A is associated with the scales WB, SP, and ACH, reflecting positive emotionality in the context of individual achievement and personal agency. PEM-C is associated with scales WB and SC, tapping positive affective experience related to interactions and interconnectedness with others.

Goals of the Study

The MPQ has been incorporated into investigations of the genetic architecture of normal personality characteristics (Tellegen et al., 1988) and, as noted previously, a number of researchers have begun using the MPQ in clinically relevant research programs.

Construct validity studies have been conducted on the MPQ in normal samples (Tellegen, 1982; Tellegen & Waller, in press). Given the possibility that psychopathology might lead to distortions or qualitative changes in normal personality traits, however (Tellegen, 1985), the constructs tapped by the MPQ in a clinical sample are not clear. This study represents the first investigation of aspects of the construct validity of the MPQ in a clinically relevant population and the first step in assessing the appropriateness and utility of incorporating the MPQ into a clinical test battery. The constructs tapped by the MPQ were assessed through joint factor analyses with clinical and second-order scales of the MMPI, which served as construct markers. Subjects were drawn from the Washington University (WU) Twin Study of Psychopathology, allowing analysis of the MPQ’s primary and secondary factors across a wide range of psychological functioning. Given previously cited findings linking MPQ Negative Emotionality with Neuroticism and Positive Emotionality with Extraversion, we expected to find positive associations between MPQ scales comprising NEM and MMPI scales tapping psychological distress, anxiety, and psychopathology. PEM and its component scales were expected to be positively associated with MMPI scales that measure extraversion, excitability, and behavioral activation.
Method

The data for this study represent a subsample of the Washington University (WU) Twin Study of Psychopathology. The WU sample comprises twin probands who were consecutive admissions to university psychiatric hospital inpatient or outpatient departments or to an urban mental health center, and their cotwins, regardless of the cotwins' psychiatric status. A small number of twins (3% of sample) were ascertained retrospectively on the basis of psychiatric records. The sample includes 590 individuals representing 295 pairs of twins. Sixty-five percent of subjects were White, 34% were African American, and 1% were Hispanic or Asian American. Participants spanned a wide socioeconomic range. Although the primary database includes twin pairs, the level of analysis for this study is each individual's responses to the MMPI and MPQ.

Subjects

A subsample of individuals who completed the MMPI and MPQ was created from the broader WU sample. Subjects from the primary sample (n = 440, 75%) completed the 566-item MMPI; 386 individuals (65%) completed the MPQ. The most common reason for attrition was subject refusal or inability (often because of poor reading ability) to complete the tests. Subjects who refused testing initially were approached a minimum of two additional times. Given the length of the test battery, subject fatigue also related to attrition, particularly for the MPQ, which was administered after the MMPI. Order of test administration was not counterbalanced, because the MMPI was, in the context of the broader study, the most important psychometric measure, and the goals of the study demanded that as few MMPI scores as possible be lost to subject attrition.

Characteristics of noncompleters. Chi-square analyses comparing "completers" versus "noncompleters" of the MMPI indicated there were no differences with respect to gender, \( \chi^2(1, N = 590) = 2.3, ns \), or history of previous psychiatric treatment, \( \chi^2(5, N = 552) = 1.3, ns \). Significant differences were observed for proband versus cotwin status, however, \( \chi^2(1, N = 590) = 4.8, p < .05 \), and for psychiatric diagnosis, \( \chi^2(9, N = 584) = 55.5, p < .001 \). Cotwins were less likely to complete the test as compared with probands; similarly, individuals with no psychiatric diagnoses were less likely to complete the MMPI than were individuals with psychiatric diagnoses. There was a general tendency for siblings not involved directly in their own clinical evaluations to refuse or fail to complete the MMPI. For the MPQ, a pattern similar to that described above emerged. There were no differences with respect to history of previous psychiatric treatment, \( \chi^2(5, N = 552) = 2.9, ns \). Differences were apparent, however, between the completing and noncompleting group for proband versus cotwin status, \( \chi^2(1, N = 590) = 4.5, p < .05 \), and psychiatric diagnosis, \( \chi^2(9, N = 584) = 51.5, p < .001 \). As for the MMPI, cotwins and individuals with no diagnosis were proportionately less likely to complete the MPQ. Additionally, there was an effect for gender, \( \chi^2(1, N = 590) = 6.0, p < .01 \), with men proportionately less likely than women to complete the test.

Description of analysis sample. Valid MMPI and MPQ protocols were available for 328 subjects (56% of total sample), including 188 women and 140 men. Among these individuals were 172 (52%) twin probands (88 women, 84 men) and 156 (48%) cotwins (100 women, 56 men). Subjects ranged in age from 16 to 82 years (M = 35.9, SD = 12.8); 254 subjects were White (77%), 71 were African American (22%), 2 were Hispanic, and 1 was American. Chi-square analyses indicated that there were no differences between the analysis sample and the missing/invalid subsample with respect to proband versus cotwin status, \( \chi^2(1, N = 590) = .001, ns \), and history of psychiatric treatment, \( \chi^2(5, N = 552) = 6.3, ns \). Differences were apparent, however, between the two groups for gender, \( \chi^2(1, N = 590) = 4.2, p < .05 \), and psychiatric diagnosis, \( \chi^2(9, N = 584) = 39.8, p < .001 \). Women were proportionately more likely than men to be in the analysis sample than in the missing/invalid subsample. With respect to psychiatric diagnoses, fewer than expected individuals with no diagnosis were in the analysis sample. At the same time, individuals with psychotic disorders were overrepresented in the missing/invalid subsample. Conversely, depressed individuals were overrepresented in the analysis sample as compared with the missing/invalid sample.

Psychiatric diagnoses. Subjects were diagnosed by a panel of two to seven diagnosticians who were unaware of the psychometric data but had access to a wide range of psychological symptom data, including the Diagnostic Interview Schedule (DIS; Robins et al., 1981), the Home Environment and Lifetime Psychiatric Evaluation Record (HELPER), and discharge summaries from previous treatment. All salient DSM-III diagnoses were assigned by each judge. Because the DIS does not generate personality disorder diagnoses, except for antisocial personality disorder, DSM-III Axis II diagnoses were made primarily on the basis of subjects' history of symptoms and previous hospital records. A latent class diagnostic model was developed (Carey, 1989; Vogler, Gottems, & Knesevich, 1988) to assess the likelihood that a subject belonged to a particular diagnostic class given diagnostic ratings by multiple judges. Details of the diagnostic procedure are summarized by DiLalla et al. (1993). Broad groupings of main lifetime latent class diagnoses broken down by proband vs. cotwin status appear in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Broad Latent Class Diagnostic Categories by Twin Status</th>
<th>Main lifetime diagnosis frequencies and percentages (N = 328)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad diagnosis</td>
<td>Proband</td>
</tr>
<tr>
<td>Mushy</td>
<td></td>
</tr>
<tr>
<td>Psychotic disorders</td>
<td>44</td>
</tr>
<tr>
<td>Antisocial personality disorder</td>
<td>42</td>
</tr>
<tr>
<td>Nonpsychotic depressive disorders</td>
<td>37</td>
</tr>
<tr>
<td>Anxiety/phobic disorders</td>
<td>9</td>
</tr>
<tr>
<td>Substance abuse disorders</td>
<td>27</td>
</tr>
<tr>
<td>DSM-III-R Cluster-B personality disorders</td>
<td>4</td>
</tr>
<tr>
<td>DSM-III-R Cluster-C personality disorders</td>
<td>1</td>
</tr>
<tr>
<td>Mixed personality disorder</td>
<td>1</td>
</tr>
<tr>
<td>No latent class diagnosis</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
</tr>
</tbody>
</table>

Note. DSM-III-R = Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev).
*a Diagnostic data missing for 6 subjects.  b Excludes antisocial personality disorder.
The 53 cotwins without latent class diagnoses but with psychiatrically ill twin siblings constitute a group at risk for developing psychopathology (Gottesman, 1991; Gottesman & Shields, 1982; Vandenberg, Singer, & Pauls, 1986). For probands as well as cotwins, there was substantial preexisting psychopathology as indexed by self-reported history of psychiatric treatment (see Table 2). Almost all probands (98%) and a majority of cotwins (52%) reported history of emotional distress or disorder, although not all individuals sought treatment for these problems.

Procedures

As soon as was feasible following admission to the hospital or presentation at the outpatient clinic, probands were given the MMPI and then the MPQ. The interval between admission and testing was necessary for patients to become acclimated to the ward setting and for acutely psychotic and/or intoxicated patients to stabilize sufficiently to complete the test battery. The decision regarding when to administer the tests was made by the research team member who conducted the DIS interview. Most acutely psychotic subjects received some form of antipsychotic medication before testing. Nonpsychotic patients might also have been receiving medication (e.g., antianxiety agents or antidepressants) at the time of testing, although testing generally would have occurred before the latter medication reached therapeutic levels. Cotwins were tested as soon as arrangements could be made to complete the inventories. Although medication information was not available, it is possible that some cotwins were taking psychotropic medication at the time of testing. The MMPI and MPQ were administered to cotwins in the same order as the probands.

Personality Measures

**MMPI** Test responses were scored for the traditional clinical scales and validity scales and two supplemental validity scales, Test–Retest (Greene, 1979) and Carelessness (Greene, 1978). Additionally, Welsh's (1965) A and R scales were scored in order to represent the two commonly identified orthogonal MMPI factors (Eichman, 1961; Welsh, 1956). MMPI protocols were screened for technical validity by 1.1. Gottesman. MMPIs were judged invalid if the sum of the Test–Retest and Carelessness scales exceeded 10 or if patterns of the traditional validity scales showed evidence of a random sort or extreme false-good or fake-bad response set. Traditional validity scale criteria were not used (e.g., extreme F) because of evidence that very high F may be obtained validly by psychotic individuals (Gynther, Altman, & Warbin, 1973; Marks & Seeman, 1963; Walters, 1988). Using these criteria, 412 subjects had valid MMPIs; 328 of these individuals also had a valid MPQ.

**MPQ** Test responses were computer-scored for the 11 primary factor scales, 3 validity scales, 3 supplemental validity scales, and 3 higher order personality dimensions. Eight MPQs were judged to be invalid at the time of testing (e.g., filling in more than 300 items on the answer sheet) and were dropped from the sample. In keeping with Ttelegen's (1982) recommendation, MPQs were judged to be invalid if the index of Invalid Responding (1HR) scale exceeded a raw score of 38 or the number of items skipped was greater than 15 (5% of total items). Forty invalid MPQs were excluded from the analyses. The number of invalid MPQs (10%) was higher than expected; this may be related to fatigue, given that individuals took the MPQ following the MMPI. The final MPQ sample comprised 338 subjects, 328 of whom also had a valid MMPI.

Statistical Analyses

Exploratory factor analyses were undertaken to elucidate the degree of construct overlap among primary scales and second-order factor scales of the MPQ and the MMPI. Primary MMPI and MPQ scales were compared by evaluating the pattern of orthogonally rotated factor loadings resulting when the scales were factor analyzed jointly. Relationships among MMPI and MPQ scales were clarified further by investigating convergent–discriminant patterns among second-order MPQ and MMPI factor scales. For the latter analysis, MPQ scales PEM, NEM, and CO, and MMPI scales A and R (Welsh, 1965) were correlated and then factor analyzed jointly. All factor analyses were conducted with the SPSS-PC+(Norusis & SPSS, 1988) factor program, using principal-components analysis with orthogonal (Varimax) rotation. The criteria used to determine the number of factors to extract and rotate included the following: factors with eigenvalues exceeding unity (Kaiser, 1960); factors accounting for greater than 5% of test variance; the Scree Test (Cattell, 1966); and the number of factors that supported the most clear simple factor structure. Simple structure was indexed by the solution with the highest number of unambiguous marker variables per factor and the fewest number of variables with meaningful loadings (≥.4) on more than one factor.

Finally, to assess further the constructs measured by the MPQ's second-order factor scales, Pearson correlations were computed between each of the second-order factor scales and specific construct markers from the MMPI. PEM was correlated with MMPI scales Ma and Si, given these scales' relationships to extraversion and introversion, respectively; NEM was correlated with Pt, Sc, and F as markers of the MMPI Anxiety factor (Welsh, 1965) and of generalized maladjustment; CO was correlated with PD, chosen to represent a broad marker of sociopathy, and Ma, indexing a lack of behavioral restraint.

**Results**

Joint Primary Scale Factor Analysis

Correlations among raw scores for the 11 MPQ primary scales and non-K-corrected raw scores for the 10 MMPI clinical scales and 3 standard validity scales (see Appendix) were factor analyzed jointly as described above. Eigenvalues for the first 10 principal components appear in Table 3. Three-, four-, five- and six-factor solutions were extracted and rotated orthogonally. The four-factor solution provided the clearest simple structure and was judged to be most interpretable. The five- and six-factor models included a high number of cross-loading scales from the MMPI and the MPQ, with a cohesive factor from the four-factor solution split into two or three factors when more than four factors were extracted. Conversely, the three-factor solution

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Table 2

<table>
<thead>
<tr>
<th>Highest level of treatment</th>
<th>Probands</th>
<th>Cotwins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>None/No problems</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Problems reported, no treatment</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Nonphysician</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nonphysician</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Outpatient psychiatric</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>Inpatient psychiatric</td>
<td>142</td>
<td>83</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>155</td>
</tr>
</tbody>
</table>
Table 3
Eigenvalues and Variance Accounted for by First 10 Factors of Joint MMPI/MPQ Principal-Components Analysis

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>% Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.6</td>
<td>35.8</td>
</tr>
<tr>
<td>2</td>
<td>3.3</td>
<td>13.7</td>
</tr>
<tr>
<td>3</td>
<td>1.8</td>
<td>7.4</td>
</tr>
<tr>
<td>4</td>
<td>1.6</td>
<td>6.7</td>
</tr>
<tr>
<td>5</td>
<td>1.4</td>
<td>5.9</td>
</tr>
<tr>
<td>6</td>
<td>.95</td>
<td>3.9</td>
</tr>
<tr>
<td>7</td>
<td>.92</td>
<td>3.8</td>
</tr>
<tr>
<td>8</td>
<td>.74</td>
<td>3.1</td>
</tr>
<tr>
<td>9</td>
<td>.66</td>
<td>2.8</td>
</tr>
<tr>
<td>10</td>
<td>.55</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Note. MMPI = Minnesota Multiphasic Personality Inventory; MPQ = Multidimensional Personality Questionnaire.

Second-Order Factorial Similarity

Pearson correlations (see Table 5) were calculated among the MPQ second-order factors PEM, NEM, and CO and Welsh's (1965) A and R scales, which acted as markers for the two second-order factors generally observed in factor analyses of the MMPI clinical and validity scales. PEM was negatively correlated with both A (r = −.34, p < .001) and R (r = −.47, p < .001). NEM had a strong positive correlation with A (r = .76, p < .001) and showed a smaller but significant negative correlation with R (r = −.31, p < .001). CO showed a small but statistically significant correlation with R (r = −.13, p < .01).

The relationships among the second-order MMPI and MPQ scales were clarified further by principal-components analysis of the correlation matrix in Table 5. Eigenvalues for the five theoretical factors were 1.9, 1.5, 1.1, 1.4, and .2. A clear three-factor solution accounted for 89% of the variance among second-order MMPI and MPQ scales. Factor 1 represents a global psychopathology or anxiety dimension and was defined by high loadings on the MMPI's A scale (94) and NEM (92). Factor 2 taps introversion versus extraversion, with MMPI scales R and PEM loading −.84 and .87, respectively.

Consistent with the lower order findings, MPQ Constraint loaded solely on the final third-order factor (99), again under-
lining the lack of representation of the Constraint domain among the standard clinical and validity scales of the MMPI.

Analysis of correlations between MPQ second-order factor scales and specific construct markers drawn from the MMPI's clinical and validity scales indicated that PEM was positively associated with Ma ($r = .31, p < .001$) and negatively associated with Si ($r = -.62, p < .001$). NEM was positively correlated with Pt ($r = .72, p < .001$); Sc ($r = .73, p < .001$); and F ($r = .59, p < .001$). CO was correlated significantly, albeit modestly, with Pd ($r = -.21, p < .001$) and Ma ($r = -.24, p < .001$).

**Discussion**

These analyses have illuminated aspects of the construct validity of the MPQ in a clinically relevant sample. The results have implications for researchers desiring to incorporate a normal personality measure such as the MPQ into studies of clinical populations, as well as for the clinical assessment of personality characteristics. The results also have theoretical implications. Although continuity of the MPQ's factor structure from normal to psychopathological populations was not directly assessed in this study, the finding that similar constructs are tapped by the MPQ in normal as well as clinical samples is consonant with a continuum of personality characteristics from normal to pathological. Research currently underway on comparisons between MPQ scores of psychiatrically ill twins and their unaffected cotwins will more clearly address the issue of personality continuity.

The present results augment the interpretation of the MPQ's primary and second-order scales and extend previous findings regarding major dimensions of personality. MPQ scales marking NEM (Tellegen, 1982) clearly reflect a domain often labeled Neuroticism but also are related to the Agreeableness-Irritability/Communal Positive Emotionality dimension. The PEM marker scales (Tellegen, 1982) are associated with each other and with MMPI scales in a manner suggesting the distinction made by Tellegen and Waller (in press) between agentic and communal aspects of Positive Emotionality. More generally, the four dimensions underlying covariance among MPQ and MMPI scales bear strong similarity to four of the Big Five normal personality factors described widely in the literature (Digman, 1990), although they take on a psychopathological flavor, primarily as a result of inclusion of the MMPI's clinical scales.

**Clinical Implications**

The results of this study suggest a number of clinical uses of the MPQ, which covers related but not redundant constructs compared with the MMPI. Traditional MMPI scales, such as Si, are often heterogeneous; the more homogeneous factor-based MPQ scales can provide additional information regarding the meaning of deviant scores. For example, our results suggest that high scorers on Si would have low scores on MPQ Well Being, moderately low scores on Social Potency and Social Closeness, and moderately high scores on Stress Reaction. These MPQ scales provide a more complete picture of the geography of the psychological terrain covered by Si.

The MPQ also taps a wider range of thoughts, perceptions, and behaviors than do traditional clinical instruments. Using the MMPI (or MMPI-2) clinical scales, the domain of behaviors reflected by MPQ Constraint is not well represented. The Constraint/Psychoticism dimension is relevant to the understanding of patterns of antisocial behavior (Zuckerman, 1991; Zuckerman et al., 1988), and addition of the MPQ to a clinical assessment including the MMPI/MMPI-2 could complement information from MMPI scales Pd and Ma, commonly associated with sociopathy. A previous analysis of the WU sample (DiLalla, 1989) indicated that joint use of MPQ and MPQ scales significantly increased diagnostic predictive accuracy for antisocial personality disorder as compared with the accuracy of MMPI scales alone.

The MPQ might also provide useful clinical information in its own right. DiLalla et al. (1993) presented data from the WU sample on broad Axis I and Axis II diagnostic group differences for the MPQ's primary and second-order scales. Information from the MPQ might also assist dimensional classification of personality disorders and highlight personality trait differences within diagnostic groups. For example, a depressed individual scoring significantly higher than average on AL and AG and lower than average on HA (MPQ scales associated with Agreeableness–Irritability/Communal Positive Emotionality) would likely have a clinical presentation different from that of a depressed individual at the opposite pole of this dimension. Such information may inform treatment planning decisions.

Finally, the MPQ provides the advantage of three scales designed to aid in the evaluation of protocol technical validity, a task crucial to the endeavor of clinical assessment (Ben-Porath & Waller, 1992). These scales provide tools for assessing response bias, impression management, and response inconsistency. Two of the MPQ's validity scales, Variable Response Inconsistency (VRIN) and True Response Inconsistency (TRIN) were "exported" to the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) as experimental validity scales.

The WU Twin Study was conducted before the publication of the MMPI-2. This raises concern regarding whether or not individuals using the MPQ in conjunction with the MMPI-2 can expect similar relationships to hold as have been reported here for the MMPI. This is a valid empirical question. It is believed, however, that the present findings are applicable to the clinical

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**Table 5**

*Intercorrelation Matrix for MPQ and MMPI-Clinical Second-Order Factors (N = 328)*

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>1. PEM</td>
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<td>2. NEM</td>
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<td>—</td>
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<td>—</td>
</tr>
<tr>
<td>4. A</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>5. R</td>
<td>—</td>
<td>—</td>
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<td>—</td>
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</table>

*Note.* MPQ = Multidimensional Personality Questionnaire; MMPI = Minnesota Multiphasic Personality Inventory; PEM = MPQ Positive Emotionality; NEM = MPQ Negative Emotionality; CO = MPQ Constraint; A = MMPI Anxiety; R = MMPI Repression.
and standard validity scales of the MMPI-2, given that the composition of the MMPI-2's clinical and standard validity scales remained essentially unchanged (Butcher et al., 1989; Graham, 1990) and that raw MMPI scale scores, rather than T scores, were analyzed.

Caveats

The nature of the present sample raises potential questions regarding representativeness and generalizability. Twin studies of psychopathology have occasionally been criticized for not being representative of the population of individuals with psychopathology. At issue is whether or not twins are generally more deviant or at risk for psychopathology than are singletons. Research suggests that, in general, rates of psychopathology among twins, unlike rates among adoptees, are equivalent to that of nontwin populations (Gottsmann, 1991; Gottsmann & Shields, 1982). Still, in a general sense, the fact that the present sample comprised twins should be borne in mind with respect to generalizability of the results.

Additionally, it is important to consider the characteristics of the analysis sample and of the individuals who either refused to complete or were unable to complete the MPQ and the MMPI. By combining probands and cotwins (35% of whom had no psychiatric diagnosis in the analysis sample, the overall level of psychopathology was decreased as compared with other clinical samples. Differences also existed between the composition of the analysis sample and the group of individuals with missing or invalid test data. Cotwins, who tended to be relatively more healthy than individuals in the proband sample, were less likely than probands to complete the tests. This is not surprising, given that testing of probands was generally completed within the context of inpatient or outpatient psychiatric treatment; the cotwin sample required additional effort on the part of subjects to participate. At the same time, there was a tendency for individuals with severe psychopathology to generate invalid MMPI and MPQ protocols. Thus, a proportion of healthier subjects were lost to attrition, whereas a subset of severely psychiatrically disordered subjects were lost due to technical invalidity. Bearing the above limitations in mind, we believe that the final analysis sample is comparable to other research on psychiatric and at-risk populations.

Statistical concerns also can be raised regarding the analysis of the WU data set. First, the sample includes biologically and socially related individuals, violating assumptions about independence of subjects. This issue is most relevant, however, to testing of specific hypotheses using tests of statistical significance, and it should not affect the factor structure of psychological test data analyzed across subjects.

The use of a clinically relevant sample has obvious advantages, but the selected nature of the sample, coupled with the use of a "normal" personality questionnaire, could result in ceiling or floor effects and restricted range of personality scores, leading to attenuated correlations among personality scales. Inspection of frequency distributions for MPQ scales indicated that neither ceiling effects for negative emotionality scales nor floor effects for positive emotionality scales were evident. Moreover, F test comparisons between MPQ primary and second-order scale variances reported by Tellegen and Waller (in press) and those obtained in the present sample indicated that a moderate degree of restricted range occurred only for scales SP, CH, and TRA. More common was the finding of increased variance in the WU sample among many of the MPQ's scales (e.g., WB, SR, AL, AG, PEM, NEM, and CO). More generally, the concern regarding restricted range is greatest when undertaking hypothesis testing; whereas the raw correlations between MMPI and a small number of MPQ scales might be underestimates of the "true" correlations, the general comparability of the present results with those from normal samples suggests that attenuation did not markedly affect the joint factor structure of the MMPI and MPQ.

Finally, factor-analytic research on self-report personality scales often uses separate analyses by gender in order to investigate potential effects of gender on the factor structure of personality scores. Such an analysis was not conducted in the present study because of inadequate sample sizes for the joint factor analyses when subdividing by gender. Further research that addresses the effects of gender on the factor structure of the MPQ would be desirable.

Conclusions

A number of investigators have demonstrated the utility of the MPQ in studies of normal personality development. The present study has extended previous work by providing information about aspects of the construct validity of the MPQ in a sample heavily weighted toward psychopathology. The results indicate that the constructs tapped by the MPQ in a clinically relevant sample closely parallel those observed in normal populations, although the flavor of a clinical sample is clearly registered by the scales of the MPQ. The findings provide a first step in the process of investigating whether the MPQ can be successfully transported from general populations to psychiatric samples.

References


JOINT FACTOR ANALYSIS


### Appendix

**Correlation Matrix of MMPI-Clinical With MPQ Primary Scales (N = 328)**

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<thead>
<tr>
<th>Scale</th>
<th>WB</th>
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<th>SR</th>
<th>AL</th>
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</table>

MMPI scales: L = Lie; F = Infrequency; K = Correction; Hs = Hypochondriasis; D = Depression; Hy = Hysteria; Pd = Psychopathic Deviate; Mf = Masculinity-Femininity; Pa = Paranoia; Pt = Psychasthenia; Sc = Schizophrenia; Ma = Hypomania; Si = Social Introversion. MPQ scales: WB = Well Being; SP = Social Potency; ACH = Achievement; SC = Social Closeness; SR = Stress Reaction; AL = Alienation; AG = Aggression; CON = Control; HA = Harm Avoidance; TRA = Traditionalism; AB = Absorption.

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