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Convergent and Incremental Validity of the MMPI-2 and Rorschach on Psychotic-Related Indices

Tam K. Dao
THE FLORIDA STATE UNIVERSITY
COLLEGE OF EDUCATION

CONVERGENT AND INCREMENTAL VALIDITY OF THE MMPI-2 AND RORSCHACH ON PSYCHOTIC-RELATED INDICES

By
TAM K. DAO

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The members of the Committee approve the Dissertation of Tam K. Dao defended on April 23, 2007.

Frances Prevatt  
Professor Directing Dissertation

Thomas Joiner, Jr.  
Outside Committee Member

Gary Peterson  
Committee Member

F. Donald Kelly  
Committee Member

Approved:  
Gary Peterson, Chair, Department of Educational Psychology and Learning Systems

Marcy P. Driscoll, Dean, College of Education

The Office of Graduate Studies has verified and approved the above named committee members.
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ABSTRACT

The popularity of the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1940), MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) and the Rorschach in the assessment of psychopathology in applied settings have been well established (Archer & Krishnamurthy, 1993b; Greene, 2000). Although it might be expected that the MMPI and the Rorschach would be interrelated, a review of the literature revealed little congruence between these two widely used assessment measures (Archer & Krishnamurthy, 1993a, 1993b; Ganellen, 1996a, 1996b, 1996c; Meyer, 1996; Meyer, 1997; Meyer, Riethmiller, Brooks, Benoit, & Handler, 2000). The general goal of this study was to contribute to the understanding of the relationship between the MMPI-2 and the Rorschach variables related to psychosis in a clinical population of adults. To accomplish this goal, the current study was broken down into two specific goals. First, following previous convention (Meyer, 1997; Meyer et al., 2000), this study examined the effect of test interaction styles on the interrelationships between the MMPI-2 and the Rorschach on psychotic-related indices. Second, this study examined the incremental validity and the clinical utility of the MMPI-2 and Rorschach with regard to differential diagnosis in a sample of adult inpatients with a primary psychotic disorder (PPD) or a primary mood disorder without psychotic features (PMD). Results indicate that grouping patients according to test-interaction style, in the form of being either dilated or constricted when responding to the task, had minimal impact in the predicted direction on the level of convergence between the MMPI-2 and Rorschach. When test interaction styles were ignored, there were modest significant correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI. Similarly when patients approached each test with a similar style, there were modest significant positive correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI. When patients approached the test in an opposing manner, the MMPI-2 scales and the Rorschach variables tended to be negatively correlated. Despite significant correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI, these correlations were small in magnitude, and were not consistent with those reported by Meyer et al. (2000) and Lindgren and Carlsson (2002). On its own, the PTI showed a better overall classification rate than the MMPI-2. The PTI was able to correctly classify PPD and PMD patients 84% of the time as compared to 70% when the MMPI-2
variables were used. To assess the clinical utility of the MMPI-2 and Rorschach in differentiating psychotic patients from nonpsychotic patients, diagnostic efficiency statistics were computed at each block of the hierarchical regression analyses. When the MMPI-2 variables were entered first into the analyses, diagnostic efficiency statistics indicated that the addition of the Rorschach PTI contributed to the prediction of group membership above what was predicted by the MMPI-2 variables. When the Rorschach PTI was entered first into the analyses, diagnostic efficiency statistics showed that the MMPI-2 scales were not able to add to the predictive capacity of the Rorschach.
CHAPTER 1
INTRODUCTION

The popularity of the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1940), MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) and the Rorschach in the assessment of psychopathology in applied settings have been well established (Archer & Krishnamurthy, 1993b; Greene, 2000). Empirical surveys of test usage found that the Rorschach and MMPI were the two most extensively used (Archer, Maruish, Imhof, & Piotrowski, 1991; Piotrowski, Sherry, & Keller, 1985; Watkins, Campbell, Nieberding, & Hallmark, 1995) and researched (Archer & Krishnamurthy, 1993b) personality assessment instruments.

Although it might be expected that the MMPI and the Rorschach would be interrelated, a review of the literature revealed little congruence between these two widely used assessment measures (Archer & Krishnamurthy, 1993a, 1993b; Ganellen, 1996a, 1996b, 1996c; Meyer, 1996; Meyer, 1997; Meyer, Riethmiller, Brooks, Benoit, & Handler, 2000). The lack of convergent validity between these two instruments has become a significant conundrum in the field of psychological assessment (Meyer, 1997) and has led to multiple explanatory models (Archer, 1996; Archer & Krishnamurthy, 1993b; Ganellen, 1996a, 1996b, 1996c; Meyer, 1997; Meyer et al., 2000). Meyer (1997) and Meyer et al. (2000) speculated that, although these two instruments do not produce significant interrelationships under general conditions, meaningful relationships exist under specific psychometric conditions in which a similar response style is utilized by the subject during administration of both instruments. Alternately, Archer and Krishnamurthy (1993b) proposed that weak associations occurred as a result of methodological limitations in previous studies. They postulated that, while there is little agreement among MMPI-Rorschach variables, the use of these tests conjointly might provide a more valid assessment since each instrument is contributing to the understanding of pathology in unique ways.

Social Significance of the Study

Psychosis applies to a state of being (i.e., psychotic state) as well as distinct diagnostic entities (Courvoisie, Labellarte, & Riddle, 2001). In the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American
Psychiatric Association, 2000) a number of psychotic disorders are presented, primarily associated with schizophrenia. Schizophrenia is both the most classic and most common psychotic disorder (American Psychiatric Association, 2004). According to an annual report by the Veterans Health Administration (2001), the population of patients with psychosis continues to rise, up from 1.9% in 1999 to 2.7% in 2000, with schizophrenia affecting approximately 1% (Abreu & Filips, 2001) to 1.5% (American Psychiatric Association, 2004) of the entire world population.

The cost of suffering from a serious mental disorder such as schizophrenia can be most taxing on the individual. These costs can be extensive, ranging from language delays (Kolvin, Berney, & Yoeli, 1990), to attentional problems (Caplan, Foy, Asarnow, & Sherman, 1990), to suicidal behaviors (Tremeau, Staner, Duval, Bailey, Correa, et al., 2005). Along with the debilitating nature of the illness, there are often family and societal costs that are frequently associated with a diagnosis of psychosis. According to Richard Wyatt, chief of neuropsychiatry for the National Institute of Mental Health, schizophrenia is the most chronic, debilitating, and costly mental health illness. In a news conference at the American Psychiatric Association annual meeting, Dr. Wyatt stated that approximately 19 billion of schizophrenia’s cost involves direct treatment and 46 billion is absorbed by other factors that include lost time from work for patients and caregivers, social services, and criminal justice resources (Schizophrenia, 1996).

The ramifications of receiving late interventions for psychotic disorders have been well documented (Helgason, 1990; McGorry, 1998; Wyatt, 1990). Early interventions for individuals with psychotic disorders have been increasingly seen as possessing the potential to produce better clinical outcomes (McGorry, 1998). A series of recent articles have highlighted the relationship between the duration of untreated psychosis and clinical outcome in psychotic disorders (McGorry, 1998). For instance, Helgason (1990); Loebel et al. (1992); and Wyatt (1991) found that delays in initiating treatment of psychosis as well as the duration of the untreated psychosis were associated with substantial functional decline, treatment resistance, and increased subsequent rates of relapse. Furthermore, McGorry, Edwards, Mihalopoulos, Harrigan, et al., (1996) reported that intensive interventions following detection of psychosis in the early phase of the illness have been shown to reduce iatrogenic damage, thus effectively promoting recovery.
Both the costs associated with a psychotic illness as well as the ramifications of receiving late interventions underscore the importance of accurately and reliably diagnosing psychosis as they occur among adults. Thus, it is imperative that psychological assessments be accurate and reliable to provide information regarding an individual’s current functioning across a variety of domains.

In sum, the professional problem of adult psychosis consists of the need to accurately and consistently identify psychotic disorders as they occur among adults. In the domain of psychological services, understanding the psychometric properties of assessment instruments as well as addressing the important questions that remain regarding the relationships between assessment instruments in identifying psychotic patients addresses this need. Research in this area would increase the likelihood of earlier interventions for adults diagnosed with psychotic disorders. The failure to do so would lead to the aforementioned consequences of receiving late interventions in psychotic disorders.

**Statement of the Problem**

With such popularity among clinicians, it should be of no surprise that the MMPI and the Rorschach are two of the most widely researched personality assessment instruments (Archer & Krishnamurthy, 1993a). Butcher (1987) reported that over 10,000 books and articles on the MMPI have been published between 1943 and 1986. Ganellen (1996b) reported that more than 16,000 research publications existed pertaining to the MMPI and the Rorschach. Exner (1997) reported Rorschach literature consisting of more than 200 books and between 8,000 and 9,000 articles. Despite the prolific numbers of publications pertaining to the MMPI and the Rorschach, a surprisingly small number of these publications have examined the interrelationships between these two tests (Archer, 1996; Archer & Krishnamurthy, 1993a; Ganellen, 1996b).

**A Lack of Convergence Between Psychotic-Related MMPI/Rorschach Indices**

Although it might be expected that the MMPI and the Rorschach would be interrelated, a review of the literature revealed little congruence between these two widely used assessment measures (Archer & Krishnamurthy, 1993a, 1993b; Ganellen, 1996a, 1996b, 1996c; Meyer, 1996; Meyer, 1997; Meyer, Riethmiller, Brooks, Benoit, &
Handler, 2000). The lack of convergent validity between these two instruments has become a significant conundrum in the field of psychological assessment (Meyer, 1997) and has led to multiple explanatory models (Archer, 1996; Archer & Krishnamurthy, 1993b; Ganellen, 1996a, 1996b, 1996c; Meyer, 1997; Meyer et al., 2000).

As stated earlier, one view suggested that variables from these two instruments will demonstrate significant patterns of convergence if these variables are selected based on a theoretical framework as well as through carefully designed research studies. Two proponents of this perspective are Archer and Krishnamurthy (1993a, 1993b) and Ganellen (1996a, 1996b, 1996c). These authors cautioned against drawing conclusions based on previous empirical studies examining the MMPI/Rorschach interrelationships. According to these authors, weak associations can be attributed to methodological limitations that existed in those studies. A number of those limitations included inconsistent Rorschach administration and scoring procedures, small sample sizes, a lack of a priori hypotheses, inadequate control for multiple statistical tests, and inappropriate statistical procedures.

Meyer (1997) and Meyer, Riethmiller, Brooks, Benoit, and Handler (2000) offered another explanation for the lack of convergence between theoretically similar constructs on the MMPI-2 and the Rorschach. According to these authors, although these two instruments do not produce significant interrelationships under general conditions, meaningful relationships exist under specific psychometric conditions in which the subject’s response styles displayed across these two instruments are similar. For example, these authors found that if correlational analyses were limited to subjects with similar response styles across the two instruments, strong positive correlations between MMPI-2 scales and corresponding Rorschach indices were found. As well, there were strong negative correlations between MMPI-2 scales and corresponding Rorschach indices when subjects display dissonant response styles across methods.

According to Meyer, a range of test interaction styles is readily observed with both the MMPI-2 and the Rorschach (See Meyer 1997 for a detailed discussion of test interaction styles) and can be summarized into three broad categories. When completing the MMPI-2 and the Rorschach, subjects can be guarded, nondisclosing, and consciously responding to items in a socially desirable fashion; this response style is termed constricted. Others are dramatic in their endorsement of negative symptoms
and make every effort to present themselves in an unrealistically pathological manner; this response style is termed dilated. Finally, others fall into the intermediate group being neither constricted nor dilated.

**Incremental Validity Hypothesis**

Another approach to understanding the relationship between the MMPI and the Rorschach stems from the acknowledgement that these two measures do not necessarily show high interrelationships but instead, variables from the two tests might be combined to improve the prediction of a desired outcome (incremental validity). According to Sackett, Haynes, Guyatt, and Tugwell (1991), psychological information obtained on an individual through a diagnostic test is not necessarily useful or practical if this information is previously available to the assessor by other means, such as a clinical interview.

The practice by clinicians of using multiple tests to arrive at a diagnostic decision is not a new phenomenon (Ganellen, 1996b). Although psychological assessment frequently involves the administration of multiple tests to arrive at a diagnostic decision, a dearth of studies has examined the incremental validity hypothesis concerning the MMPI-2 and the Rorschach (Ganellen, 1996b). With so few studies examining the incremental validity hypothesis with respect to the MMPI-2 and the Rorschach, it is no surprise that the most current MMPI-2 and Rorschach indices of psychosis (e.g., MMPI-2 Basic and content scales and the Rorschach Perceptual Thinking Index) have yet to be rigorously tested. Thus, the utility of combining data from the MMPI-2 and the Rorschach to predict clinical diagnoses remains inconclusive.

**Purpose of the Present Study**

There has been a dearth of research examining MMPI-Rorschach interrelationships relative to the prolific amount of theoretical and empirical literature concerning these tests individually. The general goal of this study was to contribute to the understanding of the relationship between the MMPI-2 and the Rorschach variables related to psychosis in a clinical population of adults. To accomplish this goal, the current study was broken down into two specific goals. First, the present study examined the relationships between different test interaction styles and the level of agreement between psychotic-related indices on the MMPI-2 and the Rorschach.
Second, the present study explored the utility of combining data from these two instruments to predict diagnoses of psychotic and non-psychotic patients. Specifically, the study investigated the relative contribution of each test to the process of differential diagnosis while addressing many of the methodological problems highlighted in previous studies examining incremental validity.
CHAPTER 2
LITERATURE REVIEW

Based on the DSM-IV-TR, psychosis can be defined as “delusions or prominent hallucinations” without “insight into their pathological nature” (p. 297). A criterion-based definition of psychosis would consist of other positive symptoms of schizophrenia such as disorganized speech and behavior. Additionally, a conceptual definition of psychosis centers on the “loss of ego boundaries or a gross impairment in reality testing” (American Psychiatric Association, 2000, p. 297). Based on these definitions, it is not surprising that there are a number of disorders that fall under the general title of psychotic disorders (Kaplan & Sadock, 1998).

Chronic and persistent psychotic symptoms belong to one of two groups: primary psychotic disorders (e.g., schizophrenia, schizoaffective disorder, psychotic disorder, schizophreniform disorder, delusional disorder, and brief psychotic disorder) or psychosis secondary to dementia, mood disorders or other general medical conditions (Jeste & Twamley, 2004). According to Kaplan and Saddock (1998), in schizophrenia disorder, schizoaffective disorder, and brief psychotic disorder, the term psychosis refers to “delusions, any prominent hallucinations, disorganized or catatonic behavior.” In psychotic disorder due to a general medical condition and in substance-induced psychotic disorder, psychosis refers to “delusions or only those hallucinations that are not accompanied by insight” (p. 492). In mood disorders with psychotic features, psychosis is referred to as “delusions or hallucinations” (p. 492).

The DSM-IV-TR contains the American Psychiatric Association’s official diagnostic criteria for evaluating psychosis in various psychotic and non-psychotic disorders. The evaluation of psychosis in various psychotic and non-psychotic disorders involves a wide range of psychological tests (Kaplan & Saddock, 1998). In general, patients with psychosis perform similarly to patients with neurologically caused mental disorders. According to Kaplan and Saddock (1998), previous research has supported the idea that psychotic disorders, in particular schizophrenia, are the result of a brain disease that disrupts the normal functioning of many cognitive abilities. Thus, patients with psychosis often perform poorly on a wide range of neuropsychological as well as other psychological tests assessing various cognitive abilities.
Neuropsychological tests often administered to patients with schizophrenia include the Halstead-Reitan battery and the Luria-Nebraska battery. Intelligence tests such as the Wechsler Adult Intelligence Scale – 3rd Edition, Wechsler Intelligence Scale for Children – 4th Edition, and the Stanford-Binet – 5th Edition have also been shown to discriminate between patients diagnosed with and without schizophrenia (Kaplan and Saddock, 1998). Generally, individuals with schizophrenia tend to score lower on intelligence tests compared to those who were not diagnosed with schizophrenia, with low intelligence present at onset and gradually deteriorating with the progression of the disorder (Kaplan & Saddock, 1998). Projective as well as objective tests have also been used widely to assess for psychosis. Projective tests such as the Rorschach Inkblot Test and the Thematic Apperception Test have been shown to reveal bizarre ideation. Objective personality measures such as the MMPI-2 and the Millon Clinical Multiaxial Inventory – Third Edition have also been shown to assess psychotic symptoms (Kaplan & Saddock, 1998).

Review of the Literature

The MMPI (Hathaway and McKinley, 1940) and its revised edition, the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989), are the most widely used and researched self-report measures in the field of psychology (Lubin, Larsen, & Matarazzo, 1984; Lubin, Larsen, Matarazzo, Seever, 1985; Greene, 2000). The MMPI was first published in 1943 and was originally designed to aid with differential diagnosis of psychopathology (Graham, 1993). The original MMPI consisted of 10 quantitative scales (1, Hs–Hypochondriasis; 2, D-Depression; 3, Hy-Conversion Hysteria; 4, Pd-Psychopathic Deviate; 5, Mf-m-Masculinity-Femininity (Masculine); 5, Mf-f-Masculinity-Femininity (Femininity); 6, Pa-Paranoia; 7, Pt-Psychasthenia; 8, Sc-Schizophrenia; 9, Ma-Hypomania; and 0, Si-Social Introversion) constructed on 504 items that could be used to assess various categories of psychopathology. Meehl and Hathaway (1946) subsequently added validity scales (L-Lie, F-Infrequency, and K-Correction) to the MMPI to assess for test-taking attitudes (Greene, 2000) (Refer to Appendix A for descriptions of each scale).
Overview of the MMPI/MMPI-2

A review of the early literature on the utility of the original MMPI to discriminate between diagnostic categories generated mixed outcomes as to its validity in making differential diagnoses. For example, Libb, Murray, Thurstin, and Alacon (1992) compared discriminant abilities of the MMPI and the Millon Clinical Multiaxial Inventory – II (MCMI – II) in a sample of 166 psychiatric inpatients with discharge diagnoses of affective disorder, schizophrenia, substance abuse, and other disorders. The authors reported that both tests performed reasonably well in the discriminant function analyses, with the MCMI – II achieving an overall hit rate of 78% and the MMPI achieving an overall hit rate of 68%. Similarly, Schotte et al. (1991) examined the diagnostic performance of the MMPI Social Introversion (Si) scale in detecting avoidant personality disorder among 22 inpatients with avoidant personality-disorder and 60 inpatients without personality disorder. The authors reported significant differences among groups on MMPI Depression, Psychastenia, Hypomania, and Social Introversion subscales. McFall, Moore, Kivlahan, and Capestry (1988) examined elevated MMPI scores on basic scales and subscales related to schizophrenia among 45 psychotic and 56 nonpsychotic adult inpatients. The authors reported that the overall basic scale scores for schizophrenia did not distinguish between the two groups. However, psychotic patients obtained significantly higher scores on subscales measuring bizarre thinking and perceived loss of control over impulses and emotions. Nonpsychotic patients endorsed significantly more items on subscales relating to depression, anxiety, and thinking difficulties.

In contrast, Kemp, Gilbertson, and Torem (1988) investigated MMPI performances of ten adults diagnosed with multiple personality disorder and ten adults diagnosed with borderline personality disorder in an inpatient setting. Their findings revealed no significant differences between the two groups. Walters and Greene (1988) compared 45 adult psychiatric inpatients with Diagnostic and Statistical Manual of Mental Disorders (DSM – III) diagnoses of schizophrenia and 31 adult inpatients with DSM – III diagnoses of bipolar disorder on the MMPI. The authors found that although schizophrenics achieved significantly higher scores on several MMPI scales (e.g., Validity, Psychasthenia, Schizophrenia, and Social Introversion) than adult inpatients
with diagnoses of bipolar disorder, the findings were of questionable clinical significance due to small effect sizes.

The mixed results of early research regarding the clinical utility of the MMPI to discriminate among diagnostic categories are best demonstrated by Zalewski and Gottesman’s (1991) meta-analysis on MMPI data from 403 control and psychiatric samples. According to these authors, the MMPI was good at discriminating normal from clinical subjects, fair at discriminating neurotic from psychotic patients, and poorest at distinguishing schizophrenics from subjects with affective disorders and patients with anxiety disorders from patients with neurotic depression disorders. Due in part to these types of findings, the MMPI was revised and items were both added and deleted.

Similar to the MMPI, the MMPI-2 consists of 567 items with the same three validity scales and 10 clinical scales. In part, the revised MMPI-2 was developed to stay up-to-date with contemporary diagnostic nosology as well as to provide the most current normative sample, which had not been updated since the conception of the original MMPI (Ben-Porath, Graham, & Butcher, 1991). Ben-Porath et al. stated that the MMPI-2, with a new normative sample as well as additional content items and scales, allows for improved differential diagnosis compared to the original MMPI. Fortified with a new, nationally based normative sample and scales, the MMPI-2 has been reexamined by researchers for its potential in differential diagnosis of psychopathology. For instance, Ben-Portath et al. examined the contribution of the MMPI-2 content scales in the differential diagnosis of psychopathology by investigating the content scales’ ability to assist in the differentiation between schizophrenia and major depression within an inpatient psychiatric setting. Their analyses indicated that both the original clinical scales as well as the content scales contain valid information to differentiate between individuals diagnosed with schizophrenia and major depression. To be more specific, clinical scales Depression ($D$) and Mania ($Ma$) for men and $D$ and Psychastenia ($Pt$) for women were useful in discriminating between the two groups. Furthermore, content scales Bizarre Mentation ($BIZ$) and Depression ($DEP$) in men and $DEP$ and Anxiety ($ANX$) in women were similarly successful in distinguishing between the two disorders.

Along the same line, Munley, Busby, and Jaynes (1997) examined MMPI-2 profile differences among patients with discharge diagnoses of schizophrenia and major depression. They found significant multivariate effects for the basic validity scales,
clinical scales, and content scales with the major depression group scoring significantly higher than the schizophrenia group on Depression (D), Psychopathic Deviate (Pd), Psychasthenia (Pt), Social Introversion (Si), Anxiety (ANX), Depression (DEP), and Social Discomfort (SOD). Similarly, Smith, Hilsenroth, Castlebury, and Durham (1999) explored the ability of the MMPI-2 Antisocial Practices Content Scale (ASP) to correctly classify DSM-IV antisocial personality disorder (APD). The ASP scores and scores on the MMPI-2 Pd scale were compared in ten subjects with APD, 16 subjects with borderline personality disorder, 9 subjects with narcissistic personality disorder, 14 subjects with other personality disorder, and 67 controls. The authors found that the ASP exhibited an ability to differentiate APD from other personality disorders and was significantly correlated to DSM-IV diagnostic criteria for APD. More recently, Rogers, Sewell, Martin, and Vitacco (2003) examined the MMPI-2’s role in the assessment of feigning mental disorders. The authors conducted a comprehensive meta-analysis of 65 MMPI-2 feigning studies. According to the authors, the Infrequency Psychopathology (Fp) and the Infrequency (F) scales were effective in differentiating across diagnostic groups.

In summary, the usage of MMPI and MMPI-2 in making differential diagnoses can be traced back to the initial goal of its developers in providing a screening instrument to differentiate various forms of psychopathology (Hathway & McKinley, 1940). A review of the early literature on the utility of the original MMPI to discriminate between diagnostic categories generated mixed outcomes as to its validity in making differential diagnoses. However, a review of the current literature on the revised and updated MMPI-2 produced positive results as to its ability to discriminate between various conditions of psychopathology.

**Psychosis Scales on the MMPI-2**

There are a number of specific MMPI-2 Clinical scales and subscales, Supplementary scales, and Content scales that have been associated with the detection of psychosis. The Schizophrenia Scale (Sc), scale 8, is composed of 78 items designed to identify persons who are experiencing schizophrenia or schizophrenia-like conditions (Greene, 2000). Nevertheless, high elevations on this scale can be a result of a variety of reasons, in part because the items on this scale tap into different aspects of
psychopathology (e.g., unusual and atypical experiences, bizarre thought processes, social alienation, peculiar perceptions, and disturbing thoughts regarding self-identity and self-worth). According to Greene, scale 8 is the single most challenging scale to interpret in isolation due to the variety of factors than can result in an elevated score. In regards to clinical utility, Ben Porath et al. (1991) evaluated the MMPI-2 basic and content scales in differential diagnosis inpatients with schizophrenia and inpatients with major depression. They found that the Sc scale along with a number of other original clinical scales and as well as the content scales contained information that was useful in the differential diagnosis of these two conditions.

The Paranoia scale (Pa), scale 6, is composed of 40 items that assesses content areas such as suspiciousness, interpersonal sensitivity, persecutory ideas, and moral self-righteousness. The content of some of the items are unmistakably psychotic, recognizing the existence of delusions and paranoid thought processes (Greene, 2000). Similar to the scale 8, high elevations on scale 6 can occur for a variety of reasons, in part because this scale taps diverse areas of pathology.

Butcher, Graham, Williams, and Ben-Porath (1990) judiciously categorized the MMPI test items into different content areas that measure single dimensions, thus developing the current 15 MMPI-2 Content Scales (i.e., Anxiety, Fears, Obsessions, Depression, Health Concerns, Bizarre Mentation, Anger, Cynicism, Antisocial Practices, Type A, Low Self-Esteem, Social Discomfort, Family Problems, Work Interference, and Negative Treatment Indicators) (Refer to Appendix B for descriptions of each content scale). Research has demonstrated some support for the clinical use of supplementary and content scales on the MMPI-2. For instance, Ben-Porath, McCully, and Almagor (1993) investigated the incremental contribution of the MMPI-Content Scales to the prediction of self-report measures of personality and psychopathology. The authors found that, in general, the MMPI-2 Content Scales demonstrated incremental validity vis-à-vis the clinical scales to the criterion measure. Consequently, it is advised that persons indicating score elevations on the clinical scales be assessed for appropriate elevations on supplementary and content scales.

The Bizarre Mentation (BIZ) scale contains 24 items that measure psychotic thought processes, hallucinations, delusions of persecution, paranoia, and unusual thoughts and experiences (Greene, 2000). A literature review of studies examining the
The BIZ scale as an index of psychosis generated some evidence for this purpose. Ben-Portath et al. (1991) examined the contribution of the MMPI-2 content scales to the differential diagnosis of schizophrenia and major depression in 160 inpatients. They found that the Content scales BIZ and DEP were similarly successful in differentiating between the two disorders.

A number of indexes that involve combining various Validity and/or Clinical scales in a linear pattern have been proposed as additional methods of determining client’s characteristics. Goldberg (1965) suggested a linear index based on T-scores \[(\text{Scale L} + \text{Scale 6} + \text{Scale 8}) – (\text{Scale 3} – \text{Scale 7})\] as being a good indicator in differentiating neurotic and psychotic profiles\(^1\). Egger, Delsing, and De Mey (2003) investigated the diagnostic value of the Goldberg Index by examining its discriminative accuracy regarding clinical diagnosis of schizophrenia, major depression disorder, and bipolar disorder. The authors reported that the Goldberg Index mean scores were significantly different between depressive patients (44.48), psychotic patients (64.91) and bipolar patients (56.75). Furthermore, discriminant function analysis resulted in 82% of the psychotic patients correctly classified and 75% of the patients with bipolar disorder correctly classified using the Goldberg Index.

Overall, the MMPI-2 contains a number of validated basic scales (i.e., clinical scales 8 and 6 in the detection of psychosis). The clinical 8 and 6 scales are validated scales that have been associated with the detection of psychosis. Nevertheless, these scales are multidimensional in nature thus assessing various aspect of psychosis as well as other dimensions of psychopathology. To date, the research is limited with respect to Content scale BIZ and the Goldberg Index in detecting psychotic symptoms. Clearly, more empirical work is needed to improve on the understanding of these scales as they related to the detection of psychopathology.

**Overview of the Rorschach Inkblot Test**

The Rorschach Inkblot Test (RIT) is one of the most widely used projective instruments by clinical psychologists (Watkins, Campbell, Nieberding, & Hallmark, 1995). Clinicians have used the RIT to aid in differential diagnosis ever since Hermann

\(^1\) Given that the Rorschach PTI can be considered as a complex index, the inclusion of the Goldberg Index allowed the Rorschach PTI to be evaluated against a comparable MMPI-2 index. A T-score greater than 45 on the Goldberg Index suggests a psychotic profile pattern and a T-score score of 44 or below suggests a neurotic pattern.
Rorschach first reported his findings on perceptual differences between schizophrenic and non-schizophrenic patients in his monograph, *Psychodiagnostic* (Exner, 1986a). Developed by Hermann Rorschach in Switzerland in 1921, this association technique consists of 10 inkblots (five black and white and five containing colors), and was originally designed as a nomothetic instrument with the primary intention of differentiating psychopathological individuals from normal individuals (Weiner, 1986). However, the RIT progressively developed into an idiographic method of analyzing personality (Aronow, Reznikoff, & Moreland, 1995). Clinicians continued to interpret the RIT in almost an exclusively idiographic manner until approximately the mid-1900's when Hermann Rorschach's original 1921 manuscript *Psychodiagnostik* was rediscovered (Aronow et al., 1995).

By the end of the 1960s, controversy regarding the reliability and validity of the Rorschach technique had developed among researchers and clinicians (Wood, Nezworski, & Stejskal, 1996). Critics such as Eysenck (1959), Jensen (1965), and Zubin, Eron, and Schumer (1965) identified a number of problems with the Rorschach that included lack of standardized rules for administration and scoring, poor interrater reliability, lack of adequate norms, and susceptibility to situational influences. Proponents of the Rorschach technique questioned the methodology and clinical significance of the research regarding the reliability and validity of the Rorschach technique (Wood et al., 1996). The publication of the *Rorschach: A Comprehensive System* (RCS; Exner, 1974) somewhat pacified the heated controversy regarding the methodology of the Rorschach technique (Wood et al., 1996).

The RCS is used primarily as a tool to assess broad personality characteristics (Weiner, 1997). Using the original ten Rorschach Inkblots, the examiner evaluates the subject’s responses for (a) location; (b) determinants (i.e., characteristics of the inkblot that contributed to the subject’s perception; and (c) content (i.e., humans, animals, etc.). Subsequently, the RCS would examine the aforementioned components for (a) Developmental Quality (i.e., the quality of examinee’s cognitive processing; (b) Form Quality (i.e., examinee’s perceptual accuracy norm-based); (c) Popular Responses (i.e., commonness of examinee’s response); (d) Organizational Activity (i.e., examinee’s level
of cognitive organization); and (e) Special Scores (i.e., characteristics of deviant verbalization and cognitive dysfunction).

After the evaluation of the examinee’s responses, the RCS variables are quantified, re-arranged, and integrated into numerical formulas to derive interpretable data presented in the Structural Summary (Exner, 1993). The Structural Summary provides the following types of interpretive data: (a) frequency statistics for the numerous individual variables assessed by the CS; (b) seven subsections comprised of combinations and ratios of variables that evaluate various types of cognitive and affective processing; and (c) six indices that assess cognitive-perceptual proclivities related to specific types of categorical psychopathology.

Over the years, the subsequent extensions and revisions of the RCS (Exner, 1974, 1986a, 1986, 1991, 1993) have (a) established detailed, objective rules for administration, scoring, and interpretation of the Rorschach; (b) catalogued extensive data regarding the interrater reliability of the scales; (c) provided norms and reference for numerous psychiatric and nonpsychiatric groups; and (d) cited numerous empirical studies to support the validity of RCS. Since its appearance in 1974, the RCS has become the most widely researched (Shontz & Green, 1992) and the most commonly taught (Hilsenroth & Handler, 1995) system for administering, scoring, and interpreting Rorschach responses (Guarnaccia, Dill, Sabatino, & Southwick, 2001).

No projective technique has aroused more controversy than the Rorschach (Lilienfeld, Wood, & Garb, 2000). The controversy over the Rorschach has led many scholars to investigate the utility of the Rorschach for clinical assessment. In fact, the journal of Psychological Assessment (2001) recently created a special series devoted to understanding the utility of the Rorschach for clinical assessment. The special series entitled “Special Section in the Special Series” was intended to facilitate the exchange of Rorschach research using evidenced-based dialogue between two groups of scholars, ones who held a generally favorable view of the Rorschach evidence and ones who held a generally unfavorable view of the Rorschach evidence. With such controversy, it is no surprise that a review of the literature regarding the utility of the Rorschach generated mixed outcomes as to its ability to discriminate between psychiatric diagnoses.
Proponents of the RCS (Atkinson, 1986; Ganellen, 1996a; Meyer & Archer, 2001; Parker, Hanson, & Hunsley, 1988; Viglione & Hilsenroth, 2001) cited positive findings pertaining to the Rorschach’s ability to discriminate between criterion-based diagnoses. For instance, Atkinson (1986) and Parker et al. (1988) demonstrated Rorschach validity through a series of meta-analytic reviews. According to Atkinson’s review of 120 articles between 1930 and 1980, he found that the conceptual validation studies of the Rorschach were as successful as the conceptual validation studies of the MMPI. Based on his findings, Atkinson suggested that the questionable status of the Rorschach might be based on socio-cultural factors, not scientific evidence. Parker et al. (1988) examined the psychometric properties of the MMPI, Rorschach, and the Wechsler Adult Intelligence Scale (WAIS) using standard psychometric theory. According to the authors, the reliability and stability of all three tests were acceptable and approximately equivalent. Furthermore, the convergent-validity estimates for the Rorschach and MMPI were not significantly different. Based on their findings, the authors concluded that both the MMPI and the Rorschach could be considered to have adequate psychometric properties if used for the purposes for which they were designed and validated.

Other proponents of the RCS have also cited positive findings pertaining to the Rorschach’s ability to discriminate between criterion-based diagnoses. For instance, Ganellen (1996a) examined the diagnostic efficiency of the RCS for detecting depressive and psychotic disorders. Ganellen found that the revised versions of the Rorschach indices developed to detect the presence of depression (DEPI) and schizophrenia (SCZI) performed adequately. According to the authors, the Rorschach produced sensitivity scores of .75 and .82 for detecting Depression and Schizophrenia, respectively.

The Suicide Constellation (S-CON) index is another variable on the RCS that has been found to demonstrate discriminant validity. Viglione (1999) stated that on the basis of all the available data and the cost-benefit of false-positive versus false-negative errors, the continued use of the S-CON is recommended. Supporting Viglione’s statement, Fowler, Piers, Hilsenroth, Holdwick, and Padawer (2001) examined the relationship between the S-CON and lethality of suicide attempts and found that the S-CON differentiated patients who would later engage in near-lethal suicide attempts from
those who would engage in parasuicidal behavior and from those who engaged in self-destructive behaviors.

In contrast to positive Rorschach findings, a number of studies (e.g., Lilienfeld et al., 2000; Wood et al., 1996, Wood et al., 2000) have reported negative findings pertaining to the Rorschach’s ability to discriminate between patients with diverse clinical diagnoses. For instance, Lilienfeld et al. (2000) and Wood et al. (2000) reviewed the literature concerning the psychometric properties (e.g., validity) of the Rorschach over the last decade. According to the authors, the Rorschach demonstrated little validity as a diagnostic tool. In the Lilienfeld et al. (2000) article, the authors asserted:

…narrowly focused literature reviews have identified several Rorschach variables that appear to possess validity in the identification of schizophrenia, Bipolar Disorder, and perhaps schizotypal personality disorder…Nevertheless, the substantial majority of Rorschach variables have not demonstrated consistent relations to psychological disorders or personality traits (p. 39).

In a similar vein, Wood et al. (2000) claimed,

Despite a few positive findings, the Rorschach has demonstrated little validity as a diagnostic tool. Deviant verbalizations and bad form on the Rorschach, and indices based on these variables, are related to Schizophrenia and perhaps Bipolar Disorder and Schizotypal Personality Disorder. Patients with Borderline Personality Disorder also seem to give an above-average number of deviant verbalizations. Otherwise the Rorschach has not shown a well-demonstrated relationship to these disorders or to Major Depressive Disorder, Posttraumatic Stress Disorder (PTSD), anxiety disorders other than PTSD, Dissociative Identity Disorder, Dependent, Narcissistic, or Antisocial Personality Disorders, Conduct Disorder, or psychopathology (p.395).

Overall, a review of the literature on the ability of the Rorschach to discriminate among different psychiatric disorders provided ambiguous results as to the overall clinical utility of the Rorschach. However, a more consistent finding across Rorschach studies is that certain Rorschach variables and indices have demonstrated some
association with psychosis. The finding that some Rorschach variables and indices are able discriminate between psychotic patients from other individuals is consistent across the literature and consequently deserves further discussion.

**Psychosis Variables on the RCS**

According to Hermann Rorschach, one of the reasons for the design of the Rorschach was to discriminate schizophrenic patients from other individuals (Exner, 1993). Using the Rorschach, a number of studies have found positive results regarding the ability of the Rorschach to differentiate psychotic individuals from other individuals (Dao & Prevatt, 2006; Hilsenroth et al., 1998; Ilonen et al., 1999; Jorgensen, et al., 2000; Meyer, 1993; Netter & Viglione, 1994). These consistent results have led many investigators to conclude that the ability of the Rorschach to detect the bizarre and illogical processes often seen in schizophrenia is probably one of its best-validated features (Vincent & Harman, 1991).

A number of individual variables on the RCS have been associated with psychotic-like symptoms. Exner (1993) reported that Special Scores including Deviant Response ($DR$, Level 2), Fabulized Combinations ($FABCOM$, Level 2), and Contamination ($CONTAM$) are particularly indicative of very serious cognitive slippage. Hilsenroth et al. (1998) and Meyer (1997) found that schizophrenics provide significantly more deviant verbalizations, such as fabulized responses, contaminations, and other incongruous combinations than normal subjects. Furthermore, Special Scores including Total Weighted Value of Special Scores ($WSUM6$), Total Special Scores ($RawSum6$), Sum Level 2 Special Scores, and Fabulized Combination ($FABCOM$, Level 2) were some of the strongest individual criteria in the RCS for making differential diagnoses among clinical groups. Three other variables on the RCS have been strongly related to potential indicators of psychosis. The human movement responses with poor form quality ($M-$), the percentage of responses with poor form quality ($X-%$), and the human movement ($M$) individual variables have been determined to be effective in differentiating patients diagnosed with thought disorders from normal subjects (Kleiger, 1999). Exner (2000b) reported that $M$- is one of the most important and efficient variables for differentiating between schizophrenia and nonschizophrenic patients. According to Exner, $M$- represents peculiarities in thinking that are created by a
preoccupation that is most likely internally generated that becomes superimposed on reality.

One of the most widely used criteria on the Rorschach for the evaluation of psychosis is the RCS’s Schizophrenia Index (SCZI, Exner, 1993; Hilsenroth et al., 1998). The SCZI index on the RCS was developed to assist in the evaluation of schizophrenia and related disorders (Viglione, 1999), particularly in the four basic areas of inaccurate perception, disordered thinking, inadequate controls, and interpersonal ineptness (Hilsenroth et al., 1998). The revised SCZI index is made of a number of Rorschach variables combined into three groups of Rorschach scores, as follows:

1. Form Quality (Form Quality Minus [FQ-], [FQu], form Quality Ordinary [FQo], Form Quality Superior [FQ+], Conventional Form [X+%), Distorted Form [X-%], and White Space Distortion [S-%])(Exner, 1993; p. 183).

2. Human Movement (Distorted Human Movement [M-]) (Exner, 1993; p. 183).

3. Special Scores (Deviant Verbalizations [DV; weight = # x 1], Deviant Response [DR; weight = # x 3], Incongruous Combination [INCOM; weight = # x 2], Fabulized Combination [FABCOM; weight = # x 4], Contamination [CONTAM; weight = # x 7], and Inappropriate Logic [ALOG; weight = # x 5]; mild or modest [Level1] and moderate or severe [Level 2; weights = # DV x 2, # INC x 4, # DR x 6, # FAB x 7] (Exner, 1993; p. 183).

These variables are then arranged based on a combination of different values on six empirical criteria. The six empirical criteria (scored as occurring or not occurring) are the following:

1. X+% < .61 (The sum of conventional form level responses is less than 61%) and S-% .41 (The sum of minus form level white space responses is less than 41%); or X+% < .50 (The sum of conventional form level responses is less than 50%).

2. X-% > .29 (the sum of distorted form level responses is greater than 29%).

3. FQ- > FQu (The sum of minus form level responses is greater than the sum of unusual form level responses) or FQ- > FQo + FQ+ (The sum of minus form level responses is greater than the sum of ordinary plus superior form level responses).
4. *Sum Level 2 Special Score* > 1 and *FABCOM2* > 0 (The sum of level 2 special scores is greater than 1 and the sum of level 2 fabulized combinations is greater than 0).

5. Either (*Raw Sum of 6 Special Scores* > 6) or (*Weighted Sum of 6 Special Scores* > 17) (Either the sum of the above mentioned 6 Special Scores is greater than 6 or the weighted sum of the 6 Special Scores is greater 17).

6. Either: *M-* > 1 or *X-%* > .40 (Either the sum of distorted human movement is greater than 1 or the sum of distorted form level responses is greater than 40%).

Based on these six criteria, a subject would receive a score on the SCZI ranging from zero to six. According to Exner (1993), if four of these criteria are met in a given protocol then a diagnosis of schizophrenia should be considered.

Hilsenroth et al. (1998) investigated the reliability, validity, and diagnostic efficiency of the SCZI index in a sample of 128 adult patients in relation to accurate identification of patients diagnosed with schizophrenia or other psychotic disorders. The authors reported the following diagnostic efficiency statistics for the psychotic disorder sample versus a Cluster A Personality Disorder sample, considering those with SCZI scores of four or greater: Sensitivity = .73; Specificity = .44; Positive Predictive Power = .83; Negative Predictive Power = .31; and Correct Classification = .67. The authors found that the SCZI performed even better when comparing the psychotic and the non-clinical sample. The authors reported the following diagnostic efficiency statistics for psychotic disorders versus non-clinical group for those with SCZI scores of four or greater: Sensitivity = .73; Specificity = 1.0; Positive Predictive Power = 1.0; Negative Predictive Power = .85; and Correct Classification = .89. The results of the study indicated that the SCZI was effective in differentiating psychotic patients from patients with Axis II disorder and from patients in the non-clinical sample. Based on the positive results of the study, Hilsenroth et al. (1998) advocated the use of the SCZI index as one measure along with integrated data from other psychodiagnostic techniques to assess for psychosis.

Similarly, Ilonen et al. (1999) studied the diagnostic efficiency of the SCZI and the depression (DEPI) indices for detecting first-episode schizophrenia and severe depression with and without psychotic features among a sample of 27 schizophrenia patients, 13 bipolar I patients, 28 psychotic-depressed patients, 29 non-psychotic-
depressed patients, and 60 non-clinical patients. The authors reported the following diagnostic efficiency statistics for the Schizophrenia sample versus Bipolar I, psychotic depressed, and psychotic non-depressed sample for those with SCZI index scores of four or greater: Sensitivity = .70; Specificity = .87; Positive Predictive Power = .68; Negative Predictive Power = .88; False Positive = .13; False Negative = .33; and Correct Classification = .82. Similarly to Hilsenroth et al. (1998), Ilonen et al. found that the SCZI performed even better at differentiating schizophrenia from the non-clinical sample. The authors reported the following diagnostic efficiency statistics for the Schizophrenia sample versus non-clinical sample for those with SCZI index scores of four or greater: Sensitivity = .70; Specificity = 1.00; Positive Predictive Power = 1.00; Negative Predictive Power = .88; False Positive = 0.00; False Negative = .33; and Correct Classification = .91. Based on the results of their study, Ilonen et al. (1999) concluded that the “SCZI is reasonably sturdy in identifying people who are seriously disturbed” (pg.190).

Although a number of studies have indicated that the SCZI may be helpful in differentiating psychotic patients from other clinical groups (e.g., Ganellen, 1996a; Ganellen, 1996b; Hilsenroth et al., 1998; Ilonen et al., 1999), Exner has made further revisions with a new index, the Perceptual Thinking Index (PTI, Exner 2000a, 2000b). To date, the PTI has replaced the SCZI as the preferred index for assessing cognition prior to interpreting other variables that may be related to thought disturbance (Exner, 2000b). According to Exner, when applying the cutoff value of four, the SCZI routinely identifies between 65% and 80% of persons diagnosed as schizophrenic. Nevertheless, the SCZI has also been shown to falsely identify approximately 10% to 20% of persons with other relatively serious problems, such as those suffering from a major affective disturbance. Exner also noted that the false positive rate was substantial among pre-adolescent and adolescent populations. According to Exner, these factors prompted a series of new studies concerned with improving the validity of the SCZI index, in particularly its ability to identify persons who have cognitive disturbances. In creating the PTI index, Exner (2000b) revised the SCZI variables by modifying those that had false positive rates.

Similar to the SCZI, the PTI is not intended as a diagnostic tool to identify schizophrenia specifically but as a tool to alert clinicians to the possibility of a thought
disorder (Smith, Baity, Knowles, & Hilsenroth, 2001). The PTI is comprised of eight Rorschach variables, which are arranged based on a combination of different values on five empirical criteria. It measures both perceptual oddities and cognitive slippage (Smith et al., 2001). Furthermore, the PTI contains two variables new to the RCS (Exner, 2003), XA% and WDA%. The new variable XA% is defined as the sum of all form quality plus (+), ordinary (o), and unusual (u) responses divided by R. The variable WDA% is calculated by dividing the sum of +, o, and u responses given to the W and D areas by the sum of all responses given the to the W and D areas. The PTI is made of a number of Rorschach variables combined into three groups of Rorschach scores, as follows (see Appendix C for a description of variables):

1. Form Quality (Form Quality Minus [FQ-], Form Quality Unusual [FQu], Form Quality Ordinary [FQo], Form Quality Superior [FQ+], Conventional Form [X+%], Distorted Form [X-], and White Space Distortion [S-%])(Exner, 1993; p. 183).
2. Human Movement (Distorted Human Movement [M-]) (Exner, 1993; p. 183).
3. Special Scores (Deviant Verbalizations [DV; weight = # x 1], Deviant Response [DR; weight = # x 3], Incongruous Combination [INCOM; weight = # x 2], Fabulized Combination [FABCOM; weight = # x 4], Contamination [CONTAM; weight = # x 7], and Inappropriate Logic [ALOG; weight = # x 5]; mild or modest [Level 1] and moderate or severe [Level 2; weights = # DV x 2, # INC x 4, # DR x 6, # FAB x 7] (Exner, 1993; p. 183).

These variables are then arranged based on a combination of different values on five empirical criteria, as follows:

1. X+% < .70 (The sum of conventional form level responses is less than 70%) and WDA% < .75 (Dividing the sum of +, o, and u responses given to the W and D areas by the sum of all responses given the to the W and D areas < 75%).
2. X-% > .29 (the sum of distorted form level responses is greater than 29%).
3. Sum Level 2 Special Score > 1 and FABCOM2 > 0 (The sum of level 2 special scores is greater than 1 and the sum of level 2 fabulized combinations is greater than 0).
4. If R < 17 (Total number of responses is less than 17) and WSUM6 > 12 (weighted sum of the 6 Special Scores is greater 12) or R> 16 (Total number of
responses is greater than 16) and WSUM6 > 17 (weighted sum of the 6 Special Scores is greater 17)

5. Either: M- > 1 or X-% > .40 (Either the sum of distorted human movement is greater than 1 or the sum of distorted form level responses is greater than 40%).

Possible scores on the PTI range from 0-5. Exner did not report PTI cutoff scores for adult populations because he promoted a dimensional approach to interpreting the PTI. According to Exner (2000b), the PTI is more conservative than the SCZI in identifying mediation or thinking problems. Preliminary research into the distributions of PTI scores for schizophrenics does not appear to be markedly different than the distribution of SCZI scores. For instance, Exner (2000b) reported that in a group of 110 individuals having DSM diagnoses of schizophrenia, 84 individuals had SCZI values of four or greater and 62 of those 84 had values of five or six. In comparison, the distribution of PTI scores for the 110 individuals revealed that 61 had values of four or five and 22 had values of three.

A review of the literature produced two studies that examined the validity of the PTI among children and adolescents and non-U.S. adult populations. Smith et al. (2001) investigated the relationship of Rorschach variables (PTI, SCZI, M-, and X-%) to thought disorder indices of a behavior rating scale and a self-report measure among children and adolescents. Using a cutoff score of ≥ 3 (representing approximately one standard deviation above the mean for the sample), the authors found that the PTI differentiated between those patients with and without elevated thought disorder scores on the rating scale and self-report. In addition, the PTI, unlike the SCZI, significantly differentiated between patients with clinically significant symptoms on the parent rating scale. According to the authors, the differences in performance between the PTI and SCZI suggest that the PTI might be a more valid measure of thought disorder in children and adolescents than the SCZI. Ritsher (2004) investigated the relationships between the Rorschach and MMPI and schizophrenia spectrum diagnoses in a Russian sample of 180 adult psychiatric patients. Ritsher found modest support for both the SCZI and PTI, but not the MMPI indicators (Sc, Sc3, Sc6, and BIZ), in detecting psychosis. More recently, Dao & Prevatt (2006) investigated the reliability and validity of the PTI among an adult inpatient population. The authors reported the following major findings when diagnostic efficiency statistics were computed when various PTI cutoff scores (i.e., PTI
were used: (a) sensitivity, negative predictive power, false positive rate, and overall correct classification rates were lower when higher PTI cutoff scores were used; (b) specificity, positive predictive power, and false negative rate were higher when higher PTI cutoff scores were used; (c) subjects from psychotic group produced PTI scores as high as 5; (d) subjects in the non-psychotic group produced PTI scores of no greater than 3; (e) the overall correct classification (OCC) rate and kappa coefficient indicate a cut-off of 3 is optimal in this sample.

In summary, there are a number of RCS variables that are associated with psychosis and schizophrenia. The independent variables XA%; WDA%; X-%; Sum Level 2 Special Score; FABCOM, Level 2; WSUM6; CONTAM; Deviant Response, Level 2; M, INCOM, and M-% have been consistently reported in the literature as criteria for making differential diagnoses among clinical groups. Furthermore, RCS indices consisting of an array of Rorschach variables have also been shown in the literature to be related to psychosis. For example, the SCZI index has been shown to be consistent in the detection of psychosis both from empirical studies conducted by the Rorschach Workshops as well as from independent scholars. The new PTI index remains to be scrutinized and confirmed by independent scholars for the adult population in the United States.

**Explanatory Models for MMPI-Rorschach Relationships**

As noted previously, Archer and Krishnamurthy demonstrated that minimal relation exists between the similarly named MMPI and Rorschach variables. As well, Archer (1996) stated that an extensive review of empirical literature spanning 50 years and 45 published investigations led to the conclusion that the Rorschach and the MMPI bear little or no meaningful relationship to each other. The lack of convergent validity between the two instruments has become a significant conundrum in the field of psychological assessment (Meyer, 1997) and has led to multiple explanatory models (Archer, 1996; Meyer, 1997).

One view suggested that variables from the two instruments will demonstrate significant patterns of convergence only if these variables are selected based on a theoretical framework as well as through carefully designed research studies. Two proponents of this perspective are Archer and Krishnamurthy (1993a, 1993b) and
Ganellen (1996a, 1996b, 1996c). As stated earlier, Archer and Krishnamurthy and Ganellen raised the possibility that these weak findings occurred as a result of methodological limitations that existed in previous studies examining the MMPI-Rorschach relationships. According to Archer and Krishnamurthy and Ganellen, methodological flaws inherent in previous MMPI-Rorschach studies consisted of small sample size, variability in methods of scoring, administering, and interpreting, lack of control for multiple statistical tests, failure to consider the power of the research design, and failure to use a priori experimental hypotheses.

A second explanatory model to explain the MMPI-Rorschach interrelationship was proposed by Meyer (1997) and Meyer et al. (2000). According to these authors, although these two instruments do not produce significant interrelationships under general conditions, meaningful relationships might exist under specific psychometric conditions in which the subject’s response styles displayed across the two instruments are similar. Their research suggested that the occurrence of conflicting results from these two instruments is based on three factors: (a) the methods tap unique levels of personality, (b) personality has a complex organization, and (c) response styles generate considerable method variance that must be considered in nomothetic research.

Meyer contended that one reason MMPI and the Rorschach scales are not strongly correlated is because the two tests are really measuring quite different things. For instance, scales on the MMPI measuring depression (e.g., Depression Content Scale) are consciously understood by the examinee and items on these scales are deliberately endorsed to indicate genuine depression. In contrast, depression on the Rorschach is suggested by perceptual interpretations and qualities of verbal expression (Meyer, 1997). Hence, these two measures are measuring quite different things and should not be considered equivalent.

Meyer also purported that the complexity of personality may lead to divergent findings regarding the interrelationship between the MMPI and the Rorschach. For example, many clinical conditions such as somatization, conversion, or somatoform pain disorders present on a more tacit or implicit level of personality. In clinical cases such as these, the individual may not be aware of the distress that accompanies their condition. Consequently, these individuals will not endorse items on the MMPI
measuring a certain construct such as depression. The Rorschach, however, may be able to detect depression at a more implicit level assuming that the Rorschach method can truly assess underlying personality dynamics.

The third factor proposed by Meyer et al. (2000) relates to subjects’ “response-character styles” or “test interaction styles” (p.176). Meyer (1997) and Meyer et al. proposed that although these two instruments do not produce significant interrelationships under general conditions, meaningful relationships would exist under specific psychometric conditions in which the subject’s response styles displayed across the two instruments are similar. Campbell and Fiske (1959) observed the extent to which test interaction styles affect observed scores on psychological tests. They indicated that the first and largest dimension within each test could be considered a test interaction style dimension (Meyer 1997). Consistent with Campbell and Fiske’s observation, the first MMPI dimension often accounts for about 50% of the total test variance, and about 75% to 80% of the common variance (Edwards & Edwards, 1991). Similar, the first Rorschach dimension typically accounts for about 30% of the total variance in test scores, and about 50% of the common variance (Meyer, 1997). Based on these observations, it is clear that test interaction styles do have a pervasive effect on both MMPI-2 and Rorschach observed scores. Thus, these dimensions can be used to characterize patients into one of three poles. One pole of the first and largest dimension within each test is characterized by defensive withdrawal, cognitive-emotional simplicity, or denial. The other pole is characterized by excessive engagement, heightened sensitivity, or over-reporting of problems (Meyer, 1997; Meyer et al., 2000). The intermediate pole is characterized as having neither defensive withdrawal nor excessive engagement.

To date, two procedures are used to assess test interaction styles: (a) scales designed to measure the first principle component from each test; and (b) traditional indicators of test-taking style (e.g., using validity scales F and K from the MMPI-2 and Lambda and R from the Rorschach). Despite selecting substantial different patients for analyses, both methods obtained similar results (Meyer et al., 2000). According to Meyer et al., if correlational analyses are limited to patients with similar response styles across the two instruments, there should be strong positive correlations between MMPI-2 scales and corresponding Rorschach indices. As well, there should be strong
negative correlations between MMPI-2 scales and corresponding Rorschach indices when subjects display dissonant response styles across methods.

A third explanatory model for the MMPI-Rorschach interrelationships approaches this conundrum from a unique perspective. The view concedes that the MMPI and the Rorschach do not bear high correlations with each other. However, these variables, if combined together, might significantly contribute to the prediction of the outcome variance in the criterion measure. This type of approach to the lack of convergent validity between the MMPI and the Rorschach has led to the incremental validity hypothesis (Archer and Krishnamurthy (1993b).

*Incremental Validity Hypothesis*

The incremental validity hypothesis, postulated by Archer and Krishnamurthy (1993b), suggests that, while there is little agreement among MMPI-Rorschach variables, the use of these tests conjointly might provide a more valid assessment since each instrument is contributing to the understanding of pathology in unique ways. The examination of incremental validity associated with the MMPI and Rorschach can be traced back to Kostlan (1954) who examined the utility of using the Rorschach, MMPI, Sentence Completion Test, and patient history to predict personality descriptions. In Kostlan’s study, twenty clinicians interpreted different combinations of test data which were then compared against criterion judges who used a lengthy personality checklist. He found that the most accurate personality descriptions were based on the combination of using both the patient’s social history as well as the MMPI. However, for the most part, clinicians were no more accurate in their personality descriptions than if they had only used age, occupation, education, marital status, and the referral problem. Since that time there has been mixed evidence regarding the incremental validity of the Rorschach and MMPI. Studies failing to find support for the combined use of the MMPI and Rorschach include Garb (1984), Archer and Gordon (1988), and Archer and Krishnamurthy (1997). In the study conducted by Garb, 32 studies were reviewed to examine the incremental validity of personality assessment data. Garb found that a test battery that included the Rorschach, Sentence Completion Test, and either an MMPI or a case history did not increase a clinician’s accuracy in diagnosing psychiatric patients when these data were added to demographic data. Ganellen (1996b), however,
cautioned against drawing conclusions from these findings and applying them to current assessment practices. Ganellen, in his evaluation of the studies examined by Garb, observed that none of the studies reviewed by Garb used Exner’s CS as a scoring and interpretation procedure. Consequently, incremental validity between the MMPI-2 and the Rorschach, using Exner’s CS with improved psychometric properties, has largely been ignored.

Garb (1984) and Ganellen (1996b) reported only one study examining the issue of incremental validity using the MMPI and RCS system for the Rorschach. Archer and Gordon (1988) administered the original MMPI and Rorschach to a sample of 134 adolescent inpatients. They reported no correlations between scale 2 on the MMPI and the Rorschach DEPI or between scale 8 and the Rorschach SCZI. Moreover, Scale 8 demonstrated hit rate accuracy better than the SCZI (.76 vs. .69, respectively) in detecting schizophrenia. Furthermore, the combination of scale 8 and the SCZI did not significantly increase the accuracy of diagnosis compared to that achieved using scale 8 independently. Ganellen, however, cautioned against generalizing these findings to present assessment practices due to several inherent limitations of the study. According to Ganellen, Archer and Gordon’s (1988) study used the original version of the MMPI as well as earlier versions of the SCZI and DEPI indices. Thus, it is likely that the use of the MMPI with adolescents and the deficiencies recognized in the earlier versions of the SCZI and DEPI might limit the applicability of these findings to current assessment practices. More recently, Archer and Krishnamurthy (1997) extended their earlier research by examining the extent to which combining indices from the MMPI-A and the revised Rorschach CS provides incremental validity in terms of improved diagnostic prediction. The authors replicated previous findings by Archer and Gordon (1988) and found that the classification rate was not improved when Rorschach variables were added to a combination of MMPI-A Conduct Problems, Cynicism, and Immaturity scales for adolescents diagnosed with conduct disorder.

A review of the literature produced five studies in support of the combined use of the MMPI and Rorschach in predicting relevant criteria. Ritsher (2004) investigated the relationship between MMPI (Sc, BIZ, Sc3 and Sc6) and Rorschach (SCZI and PTI) psychosis variables and schizophrenia spectrum diagnoses in a Russian sample of psychiatric patients. She found that none of the MMPI variables showed an expected
association with schizophrenia spectrum diagnoses for any of the diagnostic systems (e.g., Moscow school, Moscow ICD-9, and ICD-10). However, the SCZI and PTI had statistically significant associations with several of the diagnostic categorizations, but these associations were modest in magnitude. As well, the SCZI and PTI had higher positive predictive power values and higher specificity scores than the MMPI Sc scale and lower sensitivity and false positive rates. Meyer (2000a) examined the incremental validity of the MMPI and Rorschach with a series of meta-analyses. Within six studies, he found that the Rorschach Prognostic Rating scale demonstrated incremental validity over the MMPI Ego Strength scale in the prediction of treatment outcome. In regards to diagnostic criteria, Meyer (2000b) found that the SCZI and the DEPI contributed meaningful information to the prediction of schizophrenic and depressive disorders above and beyond that obtained from the MMPI-2 psychotic-related indices. Similarly, Blais, Hilsenroth, Castlebury, Fowler, and Baity (2001) examined the incremental validity of the Rorschach in predicting chart review ratings of antisocial, borderline, histrionic, and narcissistic personality disorders. The results suggested that both the MMPI-2 and Rorschach data added incrementally to the prediction of borderline and narcissistic personality disorder criteria; however, the findings were less clear for the incremental value of the Rorschach and MMPI-2 data in predicting the number of histrionic and antisocial personality disorder criteria. In an article on different methods for assessing incremental validity of a Rorschach variable, Dawes (1999) reevaluated Meyer and Resnick's (1996) data set and found that the Rorschach Ego Impairment Index (EII) provided a significant prediction to the maximum severity of diagnosis. In addition, the EII contributed significant unique predictive power over the MMPI variables for psychological disturbance as estimated by the maximum severity of diagnosis. In summary, the discrepant literature findings regarding the combined use of the MMPI and Rorschach suggest a clear need for further research to investigate the magnitude of MMPI-Rorschach relationships and the clinical utility provided when these instruments are used together in predicting diagnostic criteria.

The studies by Kostlan (1954), Archer and Gordon (1988), Archer and Krishnamurthy (1997), Ritsher (2004), Meyer (2000a), Blais et al. (2001), and Dawes (1999) generated mixed outcomes regarding incremental validity of the Rorschach. Clearly, more research is necessary before the issue can be resolved (Archer &
Krishnamurthy, 1993b; Wood, Nezworski, Stejskal, 1996). However, based on the MMPI-Rorschach literature examining the incremental validity hypothesis, two deductions can be extracted from the literature that are important and worth mentioning. First, it is reasonable to conclude that studies examining the incremental validity hypothesis prior to the establishment of Exner’s CS scoring system could not have benefited from the improved psychometric properties of the Rorschach or from its established interpretive routines (Viglione & Hilsenroth, 2001). Second, of those recent studies examining the incremental validity hypothesis using the Rorschach CS scoring system, some have been conducted only on adolescent populations (e.g., Archer and Krishnamurthy, 1997) while others have examined the hypothesis with variables and scales unrelated to psychosis (e.g., Blais et al., 2001). As a result, the incremental validity hypothesis with regards to the MMPI-2 and Rorschach indices measuring psychosis using the most current assessment procedures has yet to be rigorously tested among adult inpatient populations.

Conclusion

A review of the literature regarding the MMPI-2 in detecting psychosis has generated a number of specific MMPI-2 scales and indices that have been associated with the detection of psychosis. According to Greene (2000), Clinical Scales 6 (Pa) and 8 (Sc) are indicative of schizophrenia symptomatology. The Clinical scales 8 and 6 are well validated and could provide valuable information regarding psychosis. Although these scales have been associated with the detection of psychosis, scales 8 and 6 are multidimensional in nature, assessing various aspect of psychosis as well as other dimensions of psychopathology. The Content BIZ scale which contains items that measure psychotic thought processes, hallucinations, delusions of persecution, paranoia, and unusual thoughts and experiences has also been reported in the literature to predict behaviors that are characteristic of psychosis. Along with the MMPI-2 Clinical and Content scales, the Goldberg index (1965) has been reported to be a good indicator in differentiating neurotic and psychotic profiles.

Based on the Rorschach literature, there are several independent variables that have been shown in the literature to be related to psychosis and schizophrenia. Independent variables such as the WSUM6, RawSum6, Sum Level 2 Special Scores,
FABCOM (Level 2), M-, X-%, and M were some of the strongest individual criteria in the RCS for making differential diagnoses among clinical groups. Furthermore, RCS indices consisting of an array of Rorschach variables have also been shown in the literature to be related to psychosis. However, the empirical support for these variables is primarily from the unpublished Workshop Studies (Wood et al., 2000). The SCZI index has been shown to be consistent in the detection of psychosis both from empirical studies conducted by the Rorschach Workshops as well as from independent scholars. The validity of the new PTI index, although promising through means of association with the SCZI index as well as with limited supporting research, remains to be confirmed by independent scholars for the adult population.

Since the findings reported by Archer and Krishnamurthy (1993a, 1993b) regarding the MMPI-Rorschach relationships, a considerable amount of discussion has been stimulated with the purpose of providing credible explanations for low correlations between these two measures. One approach to understanding the relation between the MMPI and the Rorschach stems from the acknowledgement that these two measures do not necessarily show high interrelationships but instead, these variables might be combined to significantly contribute to the prediction of the outcome variance (incremental validity). A review of the literature generated mixed outcomes regarding incremental validity of the Rorschach. Meyer (1997) and Meyer et al. (2000) offered another explanation suggesting that although these two instruments do not produce significant interrelationships under general conditions, meaningful relationships exist under specific psychometric conditions in which the subject's response styles displayed across these two instruments are similar.

Given the lack of published research studies providing a theoretical basis for examining MMPI-2/Rorschach interrelationships, this study started with suggestions posited by Archer and Krishnamurthy (1993a, 1993b) and Ganellen (1996a; 1996b; 1996c) by using improved research methodologies to address the problems inherent in previous research. Using the outline proposed by Archer and Krishnamurthy and Ganellen as a starting point, this study examined a number of research questions using a series of statistical analyses to account for the multidimensional nature of the psychotic-related indices on MMPI-2 and the Rorschach. First, following previous convention (Meyer, 1997; Meyer et al., 2000), this study examined the effect of test
interaction styles on the interrelationships between the MMPI-2 and the Rorschach on psychotic-related indices. Second, this study examined the incremental validity and the clinical utility of the MMPI-2 and Rorschach with regard to differential diagnosis in a sample of adult inpatients with a primary psychotic disorder (PPD) or a primary mood disorder without psychotic features (PMD).

**Research Questions**

Given the statement of the problem and the purpose of the present study, a number of research questions have been formulated. The first set of research questions examined the effect of test interaction styles on the interrelationships between the MMPI-2 and the Rorschach on psychotic-related indices. A second set of research questions addressed the incremental validity of the MMPI-2 and the Rorschach while taking into consideration patients’ test interaction styles.

1. Are the relationships between psychotic-related indices on the MMPI-2 and Rorschach affected by test interaction styles?
   a. What are the relationships between test interaction styles on the MMPI-2 and the Rorschach?
   b. What are the relationships between the psychotic-related indices on these two instruments when analyses include all patients and test interaction styles are ignored?
   c. What are the relationships between the psychotic-related indices on these two instruments when analyses include only those patients who have similar test interaction styles across both methods?
   d. What are the relationships between the psychotic-related indices on these two instruments when analyses include only those patients who have opposing test interaction styles across both methods?

Research questions 2 and 3 are contingent upon the findings of research question 1. If research question 1 detects an effect for test interaction styles, then research question 2 would follow. If there is no effect for test interaction styles, then research question 3 would follow.
2. Does the conjoint use of psychotic-related indices on the MMPI-2 and the Rorschach aid in the prediction of psychotic versus non-psychotic patients while controlling for test interaction styles?
   a. For patients with similar test interaction styles, how well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when MMPI-2 scales are entered first into the hierarchical logistic regression analyses?
   b. For patients with similar test interaction styles, how well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when Rorschach variables are entered first into the hierarchical logistic regression analyses?
   c. For patients with opposing test interaction styles, how well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when MMPI-2 scales are entered first into the hierarchical logistic regression analyses?
   d. For patients with opposing test interaction styles, how well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when Rorschach variables are entered first into the hierarchical logistic regression analyses?

3. Does the conjoint use of psychotic-related indices on the MMPI-2 and the Rorschach aid in the prediction of psychotic versus non-psychotic patients?
   a. How well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when MMPI-2 scales are entered first into the hierarchical logistic regression analyses?
   b. How well do the MMPI-2 and Rorschach psychotic-related indices predict patient status when Rorschach variables are entered first into the hierarchical logistic regression analyses?
CHAPTER 3
METHODOLOGY

Chapter 3 presents the methods and procedures for this study. In particular, the presentation of the chapter has been divided into the following six sections: statement of hypotheses, population, sample, procedures, instrumentation, and data analysis. The following hypotheses were made:

Statement of the Hypotheses

Test Interaction Styles and Its Effect on Convergent Validity

1. The scales denoting the test interaction styles on the MMPI-2 are uncorrelated with scales denoting the test interaction styles on the Rorschach. This hypothesis reflects the expectation that the way a patient interacts with one test should have no impact on their way of interacting with the other test.

2. There are non-significant correlations between psychotic-related MMPI-2 and Rorschach indices when test interaction styles are ignored. This hypothesis is based on previous findings reported by Archer and Krishnamurthy (1993a, 1993b); Meyer (1997); and Meyer et al. (2000) and reflects the belief that each method solicits information in a different way, therefore; patients will react differently to each test.

3. There are significant positive correlations between psychotic-related MMPI-2 and Rorschach indices when analyses included patients who have similar test interaction styles on both methods. This hypothesis is based on previous findings by Meyer (1997) and Meyer et al. (2000) and reflects the expectation that convergence between the two tests is believed to result from congruent styles of interacting with each test.

4. There are significant negative correlations between psychotic-related MMPI-2 and Rorschach indices when analyses included patients who have disparate test interaction styles on both methods. This hypothesis is based on previous findings by Meyer (1997) and Meyer et al. (2000) and reflects the expectation that disparate test interactions styles would lead to an inverse relationship between MMPI-2 and Rorschach.
**Incremental Validity While Controlling for Test Interaction Styles**

5. The Rorschach provides additional information above and beyond the individual use of the MMPI-2 scales regarding the differentiation of psychotic and non-psychotic patients who have similar test interaction styles. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment since each instrument is contributing to the understanding of psychosis in unique ways (Blais et al., 2001; Ganellen, 1999b).

6. The MMPI-2 provides additional information above and beyond the individual use of the Rorschach regarding the differentiation of psychotic and non-psychotic patients who have similar test interaction styles. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment since each instrument is contributing to the understanding of psychosis in unique ways (Blais et al., 2001; Ganellen, 1999b).

7. The Rorschach provides additional information above and beyond the individual use of the MMPI-2 scales regarding the differentiation of psychotic and non-psychotic patients who have dissimilar test interaction styles. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment irrespective of patients’ test interaction styles.

8. The MMPI-2 provides additional information above and beyond the individual use of the Rorschach regarding the differentiation of psychotic and non-psychotic patients who have dissimilar test interaction styles. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment irrespective of patients’ test interaction styles.

**Incremental Validity Not Controlling for Test Interaction Styles**

9. The Rorschach provides additional information above and beyond the individual use of the MMPI-2 scales regarding the differentiation of psychotic and non-psychotic patients. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment since each instrument is contributing to the understanding of psychosis in unique ways (Blais et al., 2001; Ganellen, 1999b).

10. The MMPI-2 provides additional information above and beyond the individual use of the Rorschach regarding the differentiation of psychotic and non-psychotic
patients. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment since each instrument is contributing to the understanding of psychosis in unique ways (Blais et al., 2001; Ganellen, 1999b).

11. The Rorschach provides additional information above and beyond the individual use of the MMPI-2 scales regarding the differentiation of psychotic and non-psychotic patients. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment irrespective of patients' test interaction styles.

12. The MMPI-2 provides additional information above and beyond the individual use of the Rorschach regarding the differentiation of psychotic and non-psychotic patients. This hypothesis reflects the expectation that the use of both these tests conjointly provides a more valid assessment irrespective of patients’ test interaction styles.

Sample

The sample consisted of 236 patients drawn from an archival search of files at a 60-bed inpatient psychiatric facility in the southeastern United States. Ninety-four of the 236 patients in the current study were used in a previous study examining the psychometric properties of the PTI (Dao & Prevatt, 2006). The aggregate sample ranged in age from 18 to 74 years (mean age = 33) and 46% of all participants were male (n = 109). As for ethnic composition, 77% were Caucasian (n = 182), 18% were African American (n = 43), and 5% were Hispanic (n = 11). The primary psychotic disorder group (PPD; n = 108) ranged in age from 18-74 years (mean age = 35) and 56% were male (n = 61). The ethnic composition of the PPD group consisted of 72% Caucasian (n = 77), 24% African American (n = 26), and 4% Hispanic (n = 5). The primary mood disorder group (PMD; n = 128) ranged in age from 18-72 years (mean age = 32) and 45% were male (n = 57). The ethnic composition of the PMD group consisted of 81% Caucasian (n = 104), 14% African American (n = 18), and 5% Hispanic (n = 6).

To assess for potential confounding group demographic variables between the PPD and the PMD groups, chi square tests were performed on gender and ethnicity.
For gender, the chi square test indicated no significant difference, $\chi^2 (1, n = 236) = 3.35$, $p > .05$ (two-tailed) with $\varphi = .12$. A chi square test comparing Caucasian to Others (i.e., African American and Hispanic) indicated no significant difference $\chi^2 (1, n = 236) = 3.25$, $p > .05$ (two-tailed), with $\varphi = .12$. In regards to age, unpaired t-tests indicated no significant difference, $t (234) = .55$, $p > .05$ (two-tailed) with $d = .07$.

PPD ($n = 108$) and PMD ($n = 128$) groups were formed based on primary admission diagnoses. Diagnoses of the PPD group consisted of schizophrenia ($n = 94$), psychotic disorder not otherwise specified ($n = 13$), and delusional disorder ($n = 1$). Diagnoses of the PMD group consisted of major depressive disorder without psychotic features ($n = 112$) and depressive disorder not otherwise specified without psychotic features ($n = 16$). A retrospective review of chart records indicated that every patient in the PPD group was prescribed at least one antipsychotic medication while all of those in the PMD group were prescribed at least one antidepressant medication. The PPD group had 92 patients with co-morbid diagnoses, compared to 105 patients from the PMD group who had co-morbid diagnoses. The types of co-morbid diagnoses in the PPD group consisted of Axis I and Axis II disorders. Axis I co-morbid disorders for the PPD group included posttraumatic stress disorder, alcohol dependence, polysubstance dependence, generalized anxiety disorder, and panic disorder. Axis II co-morbid disorders for the PPD group consisted of schizoid personality disorder, obsessive-compulsive personality disorder, and personality disorder not otherwise specified. Similar to the PPD group, the types of co-morbid diagnoses in the PMD group consisted of Axis I and Axis II co-morbid disorders. A number of Axis I co-morbid disorders were found that included generalized anxiety disorder, alcohol dependence, polysubstance dependence, posttraumatic stress disorder, bulimia nervosa, and attention-deficit/hyperactive disorder. Axis II co-morbid disorders for the PMD group consisted of borderline personality disorder, antisocial personality disorder, and personality disorder not otherwise specified.

Procedures

Prior to the study, Institutional Review Board approval was obtained from the hospital facility as well as from the authors’ University Human Subject’s Committee. A search of medical records of adult inpatients admitted to the hospital from 2000-2006
was performed. The initial sample consisted of 1314 adult psychiatric inpatients. The selection of cases proceeded in three phases. In the first phase, cases were excluded if they did not meet the following criterion:

1. Subjects were excluded if they were not diagnosed with one of two of the following categories of psychiatric disorders: (a) primary psychotic disorder (PPD), consisting of schizophrenia, psychotic disorder not otherwise specified, and delusional disorder; or (b) primary mood disorder without psychosis (PMD) consisting of major depressive disorder without psychotic features and depressive disorder not otherwise specified without psychotic features. Based on this criterion, a total of 712 cases were excluded leaving 602 cases having diagnoses of PPD or PMD.

In the second phase, cases were excluded if they did not meet all three of the following criteria:

1. Subjects were excluded if they were not administered both the MMPI-2 and the Rorschach. Based on this criterion, 307 cases were excluded leaving 295 cases.
2. Subjects were excluded if the MMPI-2 was not scored using a computerized scoring system. Based on this criterion, eight cases were excluded leaving 287 cases.
3. Subjects were excluded if the Rorschach was not administered and scored according to the Comprehensive System’s guidelines (Exner, 1993). Based on this criterion, six cases were excluded leaving a sample size of 281 subjects.

In the third phase, the remaining 281 MMPI-2 and Rorschach protocols were examined for validity. Cases were excluded if they did not meet all three of the following conditions.

1. Subjects were excluded if Rorschach protocols were illegible or incomplete (i.e., structural summary, location sheets, etc.). Based on this criterion, 21 cases were excluded leaving 260 cases (three due to illegible handwriting and 18 due to absence of location sheets).
2. Subjects were excluded if Rorschach protocols consisted of less than the minimum of 14 responses. A number of studies have cautioned against interpreting Rorschach protocols containing fewer than 14 responses (Exner,
1993; Exner & Weiner, 1995). Based on this criterion, ten cases were excluded leaving 250 cases.

3. Subjects were excluded if they did not provide a valid and accurate MMPI-2 profile assessed by the following criteria (Butcher, Graham, & Ben-Porath, 1995):
   a. The Cannot Say (?) score on the MMPI-2 was greater than 30. No cases were excluded based on this criterion.
   b. The T-score exceeded 80 on the Variable Response Inconsistency scale (VRIN). Based on this criterion, ten cases were excluded leaving 240 cases.
   c. The T-score exceeded 80 on the Lie scale (L). No cases were excluded based on this criterion.
   d. The T-score exceeded 80 on the Correction scale (K). Based on this criterion, four cases were excluded leaving 236 cases.
   e. The raw score exceeded 30 on the Infrequency scale (F). No cases were excluded based on this criterion.

Clinical diagnoses were based on intake evaluations conducted independently by a licensed psychiatrist and clinical social worker via two interview schedules, the Structured Clinical Interview for DSM-IV Axis I Disorders: Clinical Versions (SCID-CV; Michael, Spitzer, Gibbon, & William, 1996) and the Structured Clinical Interview for DSM-IV Personality Disorders (SCID-II; Michael, Spitzer, Gibbon, & William, 1997) and in accordance with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000). Intake diagnoses were established through consensus by the psychiatrist and clinical social worker within 48 hours of admission. In all cases, the intake diagnosis was established before the Rorschach was administered. Psychology interns, who were blind to the diagnosis, administered the Rorschach within the first seven days following a patient’s admission to the hospital. Once the Rorschach was administered, the Rorschach protocols were scored by the intern under the direct supervision of the director of psychological services, who was also blind to the diagnosis. Psychology interns consisted of upper-level graduate psychology students who had completed at least two years in a psychology-oriented doctoral program. Between 2000 and 2006, a number of graduate psychology interns administered Rorschach protocols. However, the supervising clinical psychologist remained the
same, thus reducing the potential problems due to multiple raters. The director of psychological services, also a licensed clinical psychologist, had over 13 years of extensive training in providing Rorschach administration, scoring, interpretation, and supervision.

Patients completed the MMPI-2 independently via paper-and-pencil under the supervision of unit staff members. Scoring of the MMPI-2 answer sheets was accomplished using a computer scoring method, which produced validity, Clinical, Content, and Supplementary scales. Administration and scoring of the MMPI-2 followed Greene’s (2000) and Butcher et al.’s (1995) recommendations while Rorschach protocols followed Exner’s (2003) Comprehensive System guidelines with the structural summary produced through the Rorschach Interpretation Assistance Program: Version 5 (RIAP-5; Exner, Weiner, & PAR Staff, 2001).

Intake evaluations were conducted for each admitted patient with approximately 80% of these patients admitted involuntary. Psychological assessment was not required of all patients that entered the hospital. Furthermore, the MMPI-2 and the Rorschach was not given to all patients as part of the admission procedure. However, the MMPI-2 and Rorschach was routinely administered as part of an assessment battery with patients who exhibited cognitive disturbances and/or depressive symptoms.

**Instrumentation**

The Minnesota Multiphasic Personality Inventory – 2 (MMPI-2)

The MMPI-2 (Butcher et al., 1989) is a structured psychological instrument that consists of 567 questions that require a true or false response. A number of articles have reported the psychometric properties of the MMPI-2 and its associated scales: major reviews (Butcher et al., 1995; Greene, Gwin & Staal, 1997), test-retest reliability (Munley, 2002; Putnam, Kurtz, Houts, 1996), predictive validity (Vendrig, Derksen, & de Mey, 2000), convergent validity (Hicklin & Widiger, 2000; Rossi, Van den Brande, Tobac, Sloore, & Hauben, 2003), and discriminant validity (Strassberg & Russell, 2000; Wise, 2001). This study used the following MMPI-2 scales and indices: Scale 6 (Pa), Scale 8 (Sc), Bizarre Mentation (BIZ) scale, and the Goldberg Index (1965). A number of studies have found the Sc scale (Bagby et al., 2005; Ben-Porath et al., 1991; Munley et al., 1997), the Pa scale (Greenblatt & Davis, 1999; Munley et al., 1997), the BIZ scale
(Greenblatt & Davis, 1999; Munley et al., 1997), and the Goldberg Index (Egger et al., 2003) to be useful in distinguishing psychotic groups from other criterion groups.

To estimate internal consistency of the MMPI-2 Pa, Sc, BIZ scales, and Goldberg Index (1965), 40 MMPI-2 protocols were chosen at random using a numbers table. Table 1 reports the internal consistency estimates for the MMPI-2 Clinical Pa, Sc, Content BIZ scales, and Goldberg Index.

Table 1
Internal Consistency Estimates for MMPI-2 Scales (n = 40)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach’s alpha</th>
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<tbody>
<tr>
<td>Scale 6 (Pa)</td>
<td>.56</td>
</tr>
<tr>
<td>Scale 8 (Sc)</td>
<td>.72</td>
</tr>
<tr>
<td>Bizarre Mentation (BIZ)</td>
<td>.79</td>
</tr>
<tr>
<td>Goldberg Index</td>
<td>.62</td>
</tr>
</tbody>
</table>

Rorschach Inkblot Test

The Rorschach Inkblot Test (RIT) consists of 10 inkblots (five black and white and five containing colors). The Rorschach Comprehensive System (RCS; Exner, 2003) scoring of the responses constitutes the basis for the Structural Summary. The Structural Summary provides the following types of interpretive data: (a) frequency statistics for the numerous individual variables assessed by the RCS, (b) seven subsections comprised of combinations and ratios of variables that evaluate various types of cognitive and affective processing, and (c) six indices that assess cognitive-perceptual proclivities related to specific types of categorical psychopathology. The following studies have examined the overall psychometric properties of the RCS: test-retest reliability (Gronnerod, 2003), inter-rater reliability (Archer & Krishnamurthy, 1997; Exner, 1993; McDowell & Acklin, 1996; Meyer et al., 2002), convergent validity (Archer & Krishnamurthy, 1993b; Archer & Krishnamurthy, 1997; Greenwald, 1997), and discriminant validity (Ball, Archer, Gordon, & French, 1991). This study used the following RCS variables: Rorschach PTI, CONTAM, Deviant Response-Level 2, and
INCOM. Certain Rorschach variables (e.g., XA%; WDA%; X-%; Sum Level 2 Special Score; FABCOM, Level 2; WSUM6; and INCOM) were excluded from additional analyses because of problems of multicollinearity in regression.

To estimate interrater reliability, 40 Rorschach protocols were chosen at random using a numbers table and rescored independently by a licensed psychologist, who was blind to the original Rorschach scores as well as to patients’ diagnoses. Using Meyer’s (1999) formulas for estimating kappa for RCS score segments, interrater agreement was calculated for the segments that include PTI variables. Intraclass correlation (ICC) reliability analyses were conducted for RCS variables. ICC coefficients were computed instead of kappa coefficients because Rorschach variables are summed scores for each protocol. Kappa coefficients would provide misleadingly low estimates of reliability for dimensional variables because standard unweighted kappa coefficients treat a 1-point disagreement as severely as a 10-point disagreement (G. J. Meyer, personal communication, October 21, 2004).

Meyer developed formulas that facilitate kappa calculations for response segments by developing and validating 11 segment formulas using 400 samples and cross-validated on 100 samples. The following segments were assessed for agreement rates: Location and Space, Developmental Quality, Determinants, Form Quality, Pairs, Content, Popular, Organizational Activity, Cognitive Special Scores, Other Special Scores, and All Special Scores. To assess key variables of interest to this study, ICC were computed using a one-way random effects model (G. J. Meyer, personal communication, July 16, 2006) for the following variables: Pure F%; PTI Total; PTI Criteria 1; PTI Criteria 2; PTI Criteria 3; PTI Criteria 4; PTI Criteria 5; XA%; WDA%; X-%; Sum Level 2 Special Score; FABCOM, Level 2; WSUM6; CONTAM; INCOM; Deviant Response, Level 2; and M-%. ICC values were computed for PureF% rather than Lambda because Lambda ICC values can be deceiving. A small difference in F can produce a large difference in Lambda (G. J. Meyer, personal communication, October 21, 2004). Kappa coefficients and ICC values were interpretive based on Cicchetti’s (1994) guidelines (<.40 = poor; .40 - .59 = fair; .60 - .74 good; >.74 excellent). Table 2 contains the percentages of observed agreement, Kappa coefficients for the Rorschach PTI segments and interpretive guidelines based on Cicchetti (1994).
Table 2
Interrater Reliability for Scoring Rorschach Response Segments in 40 Rorschach Protocols

<table>
<thead>
<tr>
<th>Criteria and Segments</th>
<th>% Agreement</th>
<th>Kappa Coefficient</th>
<th>Interpretation&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental quality</td>
<td>.84</td>
<td>.72</td>
<td>Good</td>
</tr>
<tr>
<td>Determinants</td>
<td>.81</td>
<td>.65</td>
<td>Good</td>
</tr>
<tr>
<td>Form quality</td>
<td>.85</td>
<td>.70</td>
<td>Good</td>
</tr>
<tr>
<td>Cognitive Special Scores</td>
<td>.83</td>
<td>.64</td>
<td>Good</td>
</tr>
<tr>
<td>Other Special Scores</td>
<td>.78</td>
<td>.62</td>
<td>Good</td>
</tr>
</tbody>
</table>

<sup>a</sup> Interpretations based on Cicchetti’s (1994) guidelines.

Table 3 contains the ICC coefficients for the RCS variables and interpretive guidelines based on Cicchetti’s guidelines. The range of percentage of observed agreements, Kappa coefficients, and ICC coefficients were fair to excellent, indicating that the Rorschach PTI, variables, and score segments can be reliably scored. These results were consistent with interrater reliability results reported by Hilsenroth et al. (1998), Meyer, Hilsenroth, Baxter, Exner, Fowler, Piers et al. (2002), and Smith et al. (2001).

Table 3
Summary Score Interrater Reliability for PTI Variables Across 40 Rorschach Protocols

<table>
<thead>
<tr>
<th>Variables and Criteria</th>
<th>Intraclass Correlation Coefficient&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Interpretation&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>XA%</td>
<td>.71</td>
<td>Good</td>
</tr>
<tr>
<td>WDA%</td>
<td>.59</td>
<td>Fair</td>
</tr>
</tbody>
</table>
Table 3 Continued

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PureF %</td>
<td>.68</td>
<td>Good</td>
</tr>
<tr>
<td>X-%</td>
<td>.62</td>
<td>Good</td>
</tr>
<tr>
<td>Sum Level 2 Special Score</td>
<td>.7</td>
<td>Good</td>
</tr>
<tr>
<td>FABCOM2</td>
<td>.55</td>
<td>Fair</td>
</tr>
<tr>
<td>WSUM6</td>
<td>.63</td>
<td>Good</td>
</tr>
<tr>
<td>M-%</td>
<td>.77</td>
<td>Good</td>
</tr>
<tr>
<td>CONTAM</td>
<td>.56</td>
<td>Fair</td>
</tr>
<tr>
<td>Deviant Response, Level 2</td>
<td>.51</td>
<td>Fair</td>
</tr>
<tr>
<td>INCOM</td>
<td>.50</td>
<td>Fair</td>
</tr>
<tr>
<td>PTI Criteria 1</td>
<td>.88</td>
<td>Excellent</td>
</tr>
<tr>
<td>PTI Criteria 2</td>
<td>.91</td>
<td>Excellent</td>
</tr>
<tr>
<td>PTI Criteria 3</td>
<td>.81</td>
<td>Excellent</td>
</tr>
<tr>
<td>PTI Criteria 4</td>
<td>.80</td>
<td>Excellent</td>
</tr>
<tr>
<td>PTI Criteria 5</td>
<td>.84</td>
<td>Excellent</td>
</tr>
<tr>
<td>PTI Total</td>
<td>.75</td>
<td>Good</td>
</tr>
</tbody>
</table>

*a* Intraclass correlation coefficients were computed using a one-way random effects model. *b* Interpretations based on Cicchetti’s (1994) guidelines.

**Statistical Analyses**

The first set of statistical analyses examined the effect of test interaction styles. Test interaction styles have been defined in the past using two separate sets of criteria: one based on scales designed to measure the first principle component from each test and the other based on validity scores available from summary profiles of the MMPI-2
and the Rorschach. Consistent with Campbell and Fiske’s (1959) suggestion, one pole of the first and largest dimension within each test is characterized by defensive withdrawal, cognitive-emotional simplicity, or denial. The other pole is characterized by excessive engagement, heightened sensitivity, or overreporting of problems (Meyer, 1997; Meyer et al., 2000). Using Meyer et al’s. (2000) terminology, “constricted” and “dilated” were used in this study to represent these two poles (p. 183). The Welsh's Anxiety (A) scale was designed to quantify the first principle component of the MMPI-2, thus, it was used as a variable for measuring the first factor on the MMPI-2. To assess the adequacy of the A scale for this sample, principle components analysis was conducted on the A scale along with the MMPI-2 basic, validity, and content scales. Using the 236 patient with valid MMPI-2 protocols, the first unrotated component accounted for 43.6 % of the total variance; the second and third components accounted for 21.1, and 17.6% of the total variance, respectively (see Table 4). The A scale had a loading of .90 which suggests that the A scale is a good measure of the large first factor of the MMPI-2.

Table 4
*Explained Variances for Principle Component Analysis on the MMPI-2 Anxiety Scale*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>3.565</td>
<td>50.929</td>
</tr>
<tr>
<td>2</td>
<td>1.815</td>
<td>25.928</td>
</tr>
<tr>
<td>3</td>
<td>1.323</td>
<td>18.900</td>
</tr>
<tr>
<td>4</td>
<td>.580</td>
<td>8.298</td>
</tr>
<tr>
<td>5</td>
<td>.354</td>
<td>5.058</td>
</tr>
<tr>
<td>6</td>
<td>.225</td>
<td>3.214</td>
</tr>
<tr>
<td>7</td>
<td>.078</td>
<td>1.116</td>
</tr>
</tbody>
</table>
The first component of the Rorschach has been termed Response-Engagement (R-Engagement) or Response-Complexity (Meyer et al., 2000; See Appendix D for a detailed description on how to calculate the R-Engagement scale). The formula to compute the R-Engagement scale was derived from a large sample of college students, and it is calculated using z scores with the following weights: .436(Color Shading Blends) + .372(FY) + .325(FC') + .3(FC) + .3(CF + C) + .29(Shading Blends) + .29(m) + .29(I + .27(S) + .24(FM) + .22(FV) + .21(W) + .19(MOR) + .18(M)-.24(Lambda). Using the 236 patients with valid Rorschach protocols (principle component analysis of the R-Engagement scale along with other nonredundant scores for Location, Developmental Quality, Determinants, Form Quality, and Special Scores), the first unrotated component accounted for 24.7% of the total variance; the second and third components accounted for 8.1, and 7.1% of the total variance, respectively (see Table 5). The R-Engagement scale had a loading of .93, which suggests that the R-Engagement scale is a good measure of the RCS’ large first factor.

Based on prior research (Meyer, 1997; Meyer et al., 2000), patients were considered dilated if they scored in the upper third of the A distribution and considered constricted if they scored in the lower third of the A distribution. Similarly, patients were considered dilated if they fell in the upper third of the R-Engagement distribution and considered constricted if they fell in the lower third of the R-Engagement distribution.

Table 5
Explained Variances for Principle Component Analysis on the R-Engagement Scale

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>2</td>
<td>1.714</td>
<td>19.044</td>
</tr>
</tbody>
</table>
Table 5 Continued

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.456</td>
<td>16.178</td>
<td>61.344</td>
<td>.668</td>
<td>7.419</td>
</tr>
<tr>
<td>4</td>
<td>.987</td>
<td>11.111</td>
<td></td>
<td>72.455</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.856</td>
<td>9.511</td>
<td></td>
<td>81.966</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>.602</td>
<td>6.689</td>
<td></td>
<td>88.655</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>.556</td>
<td>6.178</td>
<td></td>
<td>94.833</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>.333</td>
<td>3.700</td>
<td></td>
<td>98.533</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.132</td>
<td>1.467</td>
<td></td>
<td>100.000</td>
<td></td>
</tr>
</tbody>
</table>

Note. Extraction Method: Maximum Likelihood

Following previous conventions, constricted and dilated styles were initially defined by the upper and lower thirds of the R-Engagement scale and the A scale. For this sample, these criteria were operationally defined with cut-points of less than 17 and greater than 23 for the MMPI-2 A scale. As a result, 67 patients were classified as constricted and 71 patients were classified as dilated. The cut points for the Rorschach R-Engagement scale were less than -.901 and greater than .71, which resulted in 59 patients being classified as constricted and 62 patients classified as dilated. Examining test interaction styles across methods, these criteria identified 52 subjects (22%) as having similar styles on both the MMPI-2 and the Rorschach (i.e., dilated on both [29] or constricted on both [23], and they identified 41 subjects (17%) as having discordant or opposing response styles across methods (i.e., dilated Rorschach and constricted MMPI-2 [21] or constricted Rorschach and dilated MMPI-2 [20]).

Following Meyer et al. (2000), patients were also classified into test taking styles by profiles scores readily available from the MMPI-2 and the Rorschach summary profiles. From the MMPI-2, patients were considered dilated if they have $F$ greater than 58 and $K$ less than 50. Patients were considered constricted if they have $F$ less than 58 and $K$ greater than 50. Parallel determinations were made using the Rorschach scales. From the Rorschach, $R$ and Lambda were used to classify patients into different types.
of test taking interactions. Similar to Meyer et al. (2000), patients were classified as constricted on the Rorschach if $R$ was less than the median value of $R$ and $\text{Lambda}$ was greater than the median value of $\text{Lambda}$. Patients were classified as dilated if $R$ was greater than the median value of $R$ and $\text{Lambda}$ was less than the median value of $\text{Lambda}$.

For this sample, the median values for $R$ and $\text{Lambda}$ were 19 and .61, respectively. The median values for $F$ and $K$ were 64 and 42, respectively. Subjects were classified as constricted on the Rorschach if $R$ was less than 19 and $\text{Lambda}$ was greater than .61. Subjects were classified as dilated if $R$ was greater than 19 and $\text{Lambda}$ was less than .61. Similar to the Rorschach, determinations were made using the MMPI-2 scales. Dilated patients had $F$ greater than 64 and $K$ less than 42, and constricted subjects had $F$ less than 64 and $K$ greater than 50. Examining test interaction styles across methods, these criteria identified 43 subjects (18%) as having similar styles on both the MMPI-2 and Rorschach (i.e., dilated on both [28] or constricted on both [15], and they identified 40 subjects (17%) as having discordant or opposing response styles across methods (i.e., dilated Rorschach and constricted MMPI-2 [18] or constricted Rorschach and dilated MMPI-2 [22]).

To maximize the sample sizes included in the analyses, the two criteria sets were used in combination. Any subjects identified as having similar style by factor scales (i.e., R-Engagement and A), or by profile criteria were considered as having a similar style across methods. Concurrently, any subjects identified as having opposing style by factor scales or by profile criteria were considered to have an opposing style across methods. Table 6 illustrates the nine possible classification patterns based on two criteria which can resolve into three possible decisions. In other words, subjects can be classified as being similar, opposing, or neither based on just the profile or factor scale criteria. Once subjects have been classified by just the profile or factor scale criteria, both criteria sets were used to determine final classifications. Table 7 illustrates the nine possible classification combinations that could result from the two sets of criteria which can resolve into four possible global classification decisions. The combination criteria identified 88 patients (37%) as having similar styles on the tests and 81 patients (34%) has having opposing styles. Thus, the combination criteria employed 72% of the total sample.
### Table 6
*Profile or Factor Scale Criteria*

<table>
<thead>
<tr>
<th>Subjects</th>
<th>MMPI-2</th>
<th>Rorschach</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dilated</td>
<td>Dilated</td>
<td>Similar</td>
</tr>
<tr>
<td>2</td>
<td>Dilated</td>
<td>Neither</td>
<td>Neither</td>
</tr>
<tr>
<td>3</td>
<td>Dilated</td>
<td>Constricted</td>
<td>Opposing</td>
</tr>
<tr>
<td>4</td>
<td>Neither</td>
<td>Dilated</td>
<td>Neither</td>
</tr>
<tr>
<td>5</td>
<td>Neither</td>
<td>Neither</td>
<td>Neither</td>
</tr>
<tr>
<td>6</td>
<td>Neither</td>
<td>Constricted</td>
<td>Neither</td>
</tr>
<tr>
<td>7</td>
<td>Constricted</td>
<td>Dilated</td>
<td>Opposing</td>
</tr>
<tr>
<td>8</td>
<td>Constricted</td>
<td>Neither</td>
<td>Neither</td>
</tr>
<tr>
<td>9</td>
<td>Constricted</td>
<td>Constricted</td>
<td>Similar</td>
</tr>
</tbody>
</table>

### Table 7
*Classification Decision*

<table>
<thead>
<tr>
<th>Case</th>
<th>Profile</th>
<th>Factor Scales</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Similar</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>B</td>
<td>Similar</td>
<td>Neither</td>
<td>Similar</td>
</tr>
<tr>
<td>C</td>
<td>Similar</td>
<td>Opposing</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>D</td>
<td>Neither</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>E</td>
<td>Neither</td>
<td>Neither</td>
<td>Neither</td>
</tr>
<tr>
<td>F</td>
<td>Neither</td>
<td>Opposing</td>
<td>Opposing</td>
</tr>
<tr>
<td>G</td>
<td>Opposing</td>
<td>Similar</td>
<td>Ambiguous</td>
</tr>
</tbody>
</table>
Following previous convention (Blais et al., 2001), the Rorschach PTI was correlated with the total number of Rorschach responses \((R)\). No significant bivariate correlation (two-tailed) was found \((p < 0.05)\) between the Rorschach PTI and \(R\), thus; there was no need to partial out the effect of \(R\) for subsequent analyses. Based on recommendations of Blais et al. (2001) and Hunsley and Meyer (2003), t-test statistics were computed to examine differences between means of the PPD and PMD groups across MMPI-2 Clinical Pa, Sc, Content BIZ, and Goldberg Index scales and Rorschach PTI. For the MMPI-2, raw scores were used for the Pa scale and non-K corrected raw scores were used for the Sc scale. The Goldberg Index was computed using K-corrected T-scores. Variables that were significantly different across the two groups were used in the subsequent regression models to test incremental validity. Hierarchical, logistic regression was used with forced order entry of MMPI-2 and Rorschach variables. For the analyses, there were two data entry blocks in the hierarchy. In the first block, the MMPI-2 scales were evaluated. In the second block, the MMPI-2 variables and Rorschach PTI were evaluated simultaneously. The analyses were conducted twice. In the next set of regression analyses, the order of the entry was reversed such that the Rorschach PTI was evaluated first followed by forced order entry of the MMPI-2 variables.

Incremental validity was assessed using the Nagelkerke \(R^2\) and \(R\). The Nagelkerke \(R^2\) is the most frequently reported of the R-squared estimates (Nagelkerke, 1991). Given that Nagelkerke \(R^2\) will improve as the number of variables increases, diagnostic efficiency statistics were computed for overall correct classification (OCC), sensitivity (SENS), specificity (SPEC), positive predictive power (PPP), negative predictive power (NPP), and kappa (see Streiner, 2003) using the decision rule of a predicted probability of .50 or greater. In the current study, OCC refers to the proportion of individuals correctly identified as having PPD or PMD, SENS is defined as the proportion of people diagnosed with PPD who are detected as such; SPEC is the
proportion of people who do not meet diagnostic criteria for PPD and are correctly identified as not PPD, PPP is the percent of individuals classified as having PPD who truly have the particular disorder, NPP is the percent of individuals classified as not having PPD who truly do not have the particular disorder, and Kappa represents the level of agreement between the predictor(s) and the diagnostic criteria beyond that accounted for by chance alone.
CHAPTER 4
RESULTS

The data analyses proceeded in two sequential steps. The first set of analyses examined the effect of test interaction styles on the interrelationships between the MMPI-2 and the Rorschach on psychotic-related indices. A second set of analyses examined the incremental validity of the MMPI-2 and the Rorschach.

Research Question 1.a

The first research question examined the relationships between the interaction styles on the MMPI-2 and the Rorschach. It was hypothesized that the scales denoting the test interaction styles on the MMPI-2 would be uncorrelated with scales denoting the test interaction styles on the Rorschach. This hypothesis reflects the expectation that the way a patient interacts with one test should have no impact on their way of interacting with the other test. To address this hypothesis, bivariate correlations were obtained between MMPI-2 and Rorschach indicators of test interaction styles.

Table 8 reports the association between the MMPI-2 and the Rorschach indicators of test interaction styles. Based on the results, there was one statistically significant correlation (two tailed) between the MMPI-2 and the Rorschach indicators of test interaction styles ($p < .05$). Table 8 indicates that MMPI-2 Welsh’s Anxiety (A) scale had a correlation of .16 with the R-Engagement scale. These results were similar to Meyer et al.’s (2000) findings in which the Rorschach R-Engagement scale and the Rorschach $R$ and Lambda variables had correlations from -.03 to .13 with the MMPI-2 A, F, and K scales.

Table 8
Correlations Between Scales of Test Interaction Styles From the MMPI-2 and the Rorschach

<table>
<thead>
<tr>
<th>MMPI-2 Scale</th>
<th>Rorschach Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R-Engagement</td>
</tr>
<tr>
<td>Welsh’s Anxiety (A)</td>
<td>.16**</td>
</tr>
</tbody>
</table>
Table 8 Continued

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrequency (F)</td>
<td>0.06</td>
<td>0.06</td>
<td>0.03</td>
</tr>
<tr>
<td>Correction (K)</td>
<td>-0.08</td>
<td>-0.05</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

Note.  \( N = 236 \).  MMPI-2 = Minnesota Multiphasic Personality Inventory – 2.  R-Engagement refers to the first principle component of the Rorschach derived using factor scores.  **\( p < .01 \).

Research Question 1.b

The second research question examined the relationships between the psychotic-related indices on the MMPI-2 and the Rorschach when analyses included all patients and test interaction styles were ignored. Based on previous findings reported by Archer and Krishnamurthy (1993a, 1993b); Meyer (1997); and Meyer et al. (2000), it was hypothesized that there would be a lack of convergence between psychotic-related MMPI-2 scales and Rorschach variables when patients’ test interaction styles were ignored. This reflects the belief that each method solicits information in a different way, therefore; patients will react differently to each test. To address this hypothesis, bivariate correlations were obtained on the full sample (\( N = 236 \)) between the MMPI-2 and Rorschach on psychotic-related indices.

Table 9 reports the convergent validity correlations when all patients were considered and test interaction styles were ignored. Based on the results, there were two statistically significant correlations (two tailed) between MMPI-2 and Rorschach psychotic-related indices (\( p < .05 \)). Table 9 indicates correlations of 0.12 and 0.17 between the MMPI-2 Sc scale and the Rorschach PTI and the MMPI-2 BIZ scale and the Rorschach PTI, respectively. These results did not parallel those reported by Meyer et al. (2000) in which they found no significant correlations between the MMPI-2 (i.e., Scale 8, BIZ, and PSY-5) and the Rorschach SCZI.
Table 9
*Correlations Between MMPI-2 Scales and Rorschach Variables in Psychotic Indices When Responses Styles Are Ignored (N = 236)*

<table>
<thead>
<tr>
<th>MMPI-2 Scales</th>
<th>Rorschach Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PTI</td>
</tr>
<tr>
<td>Schizophrenia (Sc) scale</td>
<td>.12*</td>
</tr>
<tr>
<td>Paranoia (Pa) scale</td>
<td>.03</td>
</tr>
<tr>
<td>Bizarre Mentation (BIZ) scale</td>
<td>.17**</td>
</tr>
<tr>
<td>Goldberg Index</td>
<td>.05</td>
</tr>
</tbody>
</table>

Notes. MMPI-2 = Minnesota Multiphasic Personality Inventory – 2. PTI = Perceptual Thinking Index. CONTAM = Contamination. DR-L2 = Deviant Response (Level 2). INCOM = Incongruous Combination. *p < .05. **p < .01.

Research Question 1.c

The third research question examined the relationships between the psychotic-related indices on the MMPI-2 and the Rorschach when analyses included only those patients who have similar test interaction styles across both methods. It was hypothesized that there would be significant positive correlations between psychotic-related MMPI-2 and Rorschach indices when analyses included patients who have similar test interaction styles on both methods. This hypothesis is based on previous findings by Meyer (1997) and Meyer et al. (2000) and reflects the expectation that convergence between the two tests is believed to result from congruent styles of interacting with each test.

Table 10 reports the convergent validity correlations between these variables using the two criteria sets to define patients with similar test interaction styles. Based on the results, there were two statistically significant correlations (two tailed) between MMPI-2 and Rorschach psychotic-related indices (p < .05). Table 10 indicates correlations of .10 and .18 between the MMPI-2 Sc scale and the Rorschach PTI and the MMPI-2 BIZ scale and the Rorschach PTI, respectively. These results did not
parallel those reported by Meyer et al. (2000) in which they found significant correlations between the MMPI-2 (i.e., Scale 8, BIZ, and PSY-5) and the Rorschach SCZI which ranged from .40 to .55.

Table 10
MMPI-2 and Rorschach Convergent Validity Using Two Criteria Sets to Define Patients with Similar Test Interaction Styles (n = 88)

<table>
<thead>
<tr>
<th>MMPI-2 Scales</th>
<th>Rorschach Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PTI</td>
</tr>
<tr>
<td>Schizophrenia (Sc) scale</td>
<td>.10*</td>
</tr>
<tr>
<td>Paranoia (Pa) scale</td>
<td>.03</td>
</tr>
<tr>
<td>Bizarre Mentation (BIZ) scale</td>
<td>.18**</td>
</tr>
<tr>
<td>Goldberg Index</td>
<td>.06</td>
</tr>
</tbody>
</table>

Notes. MMPI-2 = Minnesota Multiphasic Personality Inventory – 2. PTI = Perceptual Thinking Index. CONTAM = Contamination. DR-L2 = Deviant Response (Level 2). INCOM = Incongruous Combination. *p < .05. **p < .01.

Research Question 1.d

The fourth research question examined the relationships between the psychotic-related indices on the MMPI-2 and the Rorschach when analyses included only those patients who have disparate test interaction styles on both methods. It was hypothesized that there would be significant negative correlations between psychotic-related MMPI-2 and Rorschach indices when analyses included patients who have disparate test interaction styles on both methods. This hypothesis is based on previous findings by Meyer (1997) and Meyer et al. (2000) and reflects the expectation that disparate test interactions styles would lead to an inverse relationship between the MMPI-2 and the Rorschach.

Table 11 reports correlations for the analysis that was limited to patients who had opposing styles of interacting on the tests. There were three statistically significant correlations (two tailed) between the MMPI-2 and the Rorschach on psychotic-related
indices \( (p < .05) \). Thus, the expectation that scales would be negatively correlated under these circumstances was generally not supported. Table 11 indicates correlations of -.15 and -.18 between the MMPI-2 Sc scale and the Rorschach PTI and the MMPI-2 BIZ scale and the Rorschach PTI, respectively. Table 11 also indicates that the MMPI-2 Sc scale had a correlation of -.10 with the Rorschach CONTAM variable. These results did not parallel those reported by Meyer et al. (2000) in which they found significant negative correlations between the MMPI-2 (i.e., Scale 8, BIZ, and PSY-5) and the Rorschach SCZI which ranged from -.39 to -.40.

Table 11  
**MMPI-2 and Rorschach Convergent Validity Using Two Criteria Sets to Define Patients with Opposing Test Interaction Styles (n = 81)**

<table>
<thead>
<tr>
<th>MMPI-2 Scales</th>
<th>Rorschach Variables</th>
<th>PTI</th>
<th>CONTAM</th>
<th>DR-L2</th>
<th>INCOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schizophrenia (Sc) scale</td>
<td>-.15**</td>
<td>-.10*</td>
<td>.04</td>
<td>-.06</td>
<td></td>
</tr>
<tr>
<td>Paranoia (Pa) scale</td>
<td>-.01</td>
<td>-.03</td>
<td>-.04</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Bizarre Mentation (BIZ) scale</td>
<td>-.18**</td>
<td>.02</td>
<td>-.01</td>
<td>-.05</td>
<td></td>
</tr>
<tr>
<td>Goldberg Index</td>
<td>.06</td>
<td>-.01</td>
<td>.02</td>
<td>.02</td>
<td></td>
</tr>
</tbody>
</table>

Notes. MMPI-2 = Minnesota Multiphasic Personality Inventory – 2. PTI = Perceptual Thinking Index. CONTAM = Contamination. DR-L2 = Deviant Response (Level 2). INCOM = Incongruous Combination. *\( p < .05 \). **\( p < .01 \).

The second set of analyses examined the incremental validity of the MMPI-2 and Rorschach. Given the minimal effect for test interaction styles on the convergence of the MMPI-2 and the Rorschach on psychotic-related indices, incremental validity was examined using the full sample to determine whether the conjoint use of psychotic-related indices on the MMPI-2 and the Rorschach aided in the prediction of psychotic versus non-psychotic patients.
The first analysis used t-tests to examine group differences between the MMPI-2 scales and the Rorschach variables (see Table 12). Results showed that the PPD group scored significantly higher than the PMD group on the MMPI-2 Clinical Pa, Sc, and Content BIZ scales and the Goldberg Index. As well, the PPD group scored significantly higher than the PMD group on the Rorschach PTI Criteria 1, 2, 5, and Total PTI. To assess for practical importance, Cohen’s $d$ (Cohen, 1988) effect sizes were computed using pooled variance and adjusted for unequal sample sizes. The results indicated that there were small to large effect sizes for significant MMPI-2 scales and the Rorschach variables. Therefore, the following variables were used in the subsequent tests of incremental validity: MMPI-2 Clinical Pa, Sc, Content BIZ scales, Goldberg Index; and the Rorschach PTI. Individual variables that constituted the Rorschach PTI were excluded from additional analyses because of problems of multicollinearity in regression.

Research Question 3.a

Table 13 contains the results for hierarchical, logistic regression analyses with the MMPI-2 scales and Rorschach PTI. Preliminary analyses were conducted to assess for potential outliers and observations of excessive influence. No outliers were identified that had a larger standardized Pearson residual than the threshold of 2.5, which is considered an adequate case index for the identification of outliers for univariate and multivariate studies. Pearson residual is defined to be the standardized difference between the observed frequency and the predicted frequency. It measures the relative deviations between the observed and fitted values (Tate, 1998). As can be seen in Table 13, the MMPI-variables were entered in Block 1, followed by the addition of the Rorschach PTI in Block 2. In Block 1, the MMPI-2 variables contributed uniquely to the prediction of group membership, $\chi^2 (4, n = 236) = 26.6, p < .05$. The Nagelkerke $R^2$, a comparable statistic to the $R^2$ in linear regression (Nagelkerke, 1991), was .34. The OCC rate using the MMPI-2 variables was 70%. The Hosmer-Lemeshow test, a test of the model goodness of fit, produced a fail to reject decision $\chi^2 (8, n = 236) = 10.6, p > .05$, a result consistent with the assumption that the specified logistic model was correct. In Block 2, the Rorschach PTI entered and added significantly to the model with a change in $\chi^2 (1, n = 236) = 45.1, p < .05$. The Nagelkerke $R^2$ was .48. The OCC rate
using a combination of MMPI-2 variables and Rorschach PTI was 84% with a good fit of the data to the model, $\chi^2 (8, n = 236) = 15.4, p > .05$. Diagnostic efficiency statistics improved with the addition of the Rorschach PTI in Block 2.

**Research Question 3.b**

Table 14 provides the result of the reverse model with the Rorschach PTI entering on Block 1 before the MMPI-2 variables were evaluated. Preliminary analyses revealed no outliers with standardized Pearson residual larger than the threshold of 2.5. Entry of the Rorschach PTI was significant in predicting group membership, $\chi^2 (1, n = 236) = 61.4, p < .05$ with a good fit of the data to the model, $\chi^2 (4, n = 236) = 8.4, p > .05$. The Nagelkerke $R^2$ was .41. The OCC rate using the Rorschach PTI was 85%. In Block 2, MMPI-2 variables contributed uniquely to the prediction of group membership with a change in $\chi^2 (4, n = 236) = 6.17, p < .05$. The Nagelkerke $R^2$ was .48. The OCC rate with the MMPI-2 variables included decreased slightly to 84% with a good fit of the data to the model, $\chi^2 (8, n = 236) = 15.4, p > .05$. Table 14 also contains the diagnostic efficiency statistics for each block of the analyses. Diagnostic efficiency statistics did not improve when the MMPI-2 variables were added to the model.
Table 12
Descriptive and T-Test Statistics and Effect Sizes for MMPI-2 Scales and Rorschach Perceptual Thinking Index (PTI) for the Total Sample and the Primary Psychotic Disorder (PPD) and Primary Mood Disorder (PMD) Groups

<table>
<thead>
<tr>
<th>MMPI-2/Rorschach</th>
<th>Total Sample (N = 236)</th>
<th>PPD Group (n = 108)</th>
<th>PMD Group (n = 128)</th>
<th>t</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
</tr>
<tr>
<td>Scale 6 (Pa)</td>
<td>13.9</td>
<td>4.0</td>
<td>3.0</td>
<td>21.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Scale 8 (Sc)</td>
<td>25.8</td>
<td>10.4</td>
<td>2.0</td>
<td>48.0</td>
<td>28.5</td>
</tr>
<tr>
<td>Bizarre Mentation (BIZ)</td>
<td>8.0</td>
<td>4.6</td>
<td>0.0</td>
<td>16.0</td>
<td>9.8</td>
</tr>
<tr>
<td>Goldberg Index</td>
<td>39.2</td>
<td>21.5</td>
<td>-10</td>
<td>91.0</td>
<td>44.4</td>
</tr>
<tr>
<td>DR, Level 2</td>
<td>.92</td>
<td>.96</td>
<td>0</td>
<td>5</td>
<td>.98</td>
</tr>
<tr>
<td>FABCOM, Level 2</td>
<td>.71</td>
<td>.82</td>
<td>0</td>
<td>3</td>
<td>.78</td>
</tr>
<tr>
<td>CONTAM</td>
<td>.16</td>
<td>.49</td>
<td>0</td>
<td>2</td>
<td>.18</td>
</tr>
<tr>
<td>PTI Criteria 1: XA% &lt; .70 and WDA% &gt; .75</td>
<td>.56</td>
<td>.50</td>
<td>0</td>
<td>1</td>
<td>.79</td>
</tr>
<tr>
<td>PTI Criteria 2: X-% &gt; .29</td>
<td>.50</td>
<td>.50</td>
<td>0</td>
<td>1</td>
<td>.73</td>
</tr>
<tr>
<td>PTI Criteria 3: Level 2 Special Score &gt; 2 and FAB2 &gt; 0</td>
<td>.17</td>
<td>.38</td>
<td>0</td>
<td>1</td>
<td>.21</td>
</tr>
<tr>
<td>PTI Criteria 4: R &lt; 17 and WSum6 &gt; 12 or R &gt; 16 and WSum6 &gt; 17</td>
<td>.16</td>
<td>.37</td>
<td>0</td>
<td>1</td>
<td>.19</td>
</tr>
<tr>
<td>PTI Criteria 5: M- &gt; 1 or X-% &gt; .40</td>
<td>.42</td>
<td>.50</td>
<td>0</td>
<td>1</td>
<td>.72</td>
</tr>
<tr>
<td>Total PTI</td>
<td>1.99</td>
<td>1.7</td>
<td>0</td>
<td>5.0</td>
<td>2.95</td>
</tr>
</tbody>
</table>

Notes. CONTAM = Contamination. DR-L2 = Deviant Response (Level 2). INCOM = Incongruous Combination. Non-K corrected raw scores were used to compute Pa, Sc, and BIZ, while K-corrected T-scores were used to compute the Goldberg Index. The MMPI-2 raw scores equate with T-scores for males/females as follows: For Pa, 13 = 61T/59T, 14 = 64T/63T, and 15 = 68T/67T; for Sc, 24 = 67T/66T, 26 = 69T/68T, and 29 = 73T/71T; and for BIZ, 7 = 67T/67T, 8 = 70T/70T, and 10 = 77T/76T. *Raw score of. *p < .01; **p < .001.
Table 13
Hierarchical, Logistic Regression Analyses Assessing the Incremental Validity of the Rorschach Perceptual Thinking Index (PTI) to Predict Primary Psychotic Disorder (PPD) versus Primary Mood Disorder (PMD) Groups over MMPI-2 Scales (N = 236)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Nagelkerke $R^2$ (R)</th>
<th>Δ Nagelkerke $R^2$ (R)</th>
<th>OCC</th>
<th>SENS</th>
<th>SPEC</th>
<th>PPP</th>
<th>NPP</th>
<th>Kappa</th>
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<tr>
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<td>.67</td>
<td>.34 (.58)</td>
<td>-</td>
<td>.70</td>
<td>.67</td>
<td>.73</td>
<td>.66</td>
<td>.74</td>
<td>.40</td>
</tr>
<tr>
<td>Scale 6 (Pa)$^a$</td>
<td>.09</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Scale 8 (Sc)$^b$</td>
<td>.08*</td>
<td>.02</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bizarre Mentation$^a$</td>
<td>.10**</td>
<td>.03</td>
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<tr>
<td>Goldberg Index$^c$</td>
<td>.03</td>
<td>.01</td>
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<tr>
<td>Constant</td>
<td>-2.2</td>
<td>.70</td>
<td>.48 (.69)</td>
<td>.14** (.37)</td>
<td>.84</td>
<td>.81</td>
<td>.87</td>
<td>.85</td>
<td>.84</td>
<td>.69</td>
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<tr>
<td>Scale 6 (Pa)$^a$</td>
<td>.05</td>
<td>.04</td>
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<tr>
<td>Scale 8 (Sc)$^b$</td>
<td>.04*</td>
<td>.03</td>
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<tr>
<td>Bizarre Mentation$^a$</td>
<td>.09*</td>
<td>.03</td>
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<tr>
<td>Goldberg Index$^c$</td>
<td>.02</td>
<td>.01</td>
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<tr>
<td>Perceptual Thinking Index</td>
<td>.66**</td>
<td>.74</td>
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</tbody>
</table>

Notes. Non-K corrected raw scores were used to compute Pa, Sc, and BIZ, while K-corrected T-scores were used to compute the Goldberg Index. OCC = Overall correct classification; SENS = Sensitivity; SPEC = Specificity; PPP = Positive predictive power; NPP = Negative predictive power. *p < .05. **p < .001.
Table 14
*Hierarchical, Logistic Regression Analyses Assessing the Incremental Validity of MMPI-2 Scales to Predict Primary Psychotic Disorder (PPD) versus Primary Mood Disorder (PMD) Groups Over the Rorschach Perceptual Thinking Index (PTI) (N = 236)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>Nagelkerke $R^2$ (R)</th>
<th>Δ Nagelkerke $R^2$ (R)</th>
<th>OCC</th>
<th>SENS</th>
<th>SPEC</th>
<th>PPP</th>
<th>NPP</th>
<th>Kappa</th>
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</tr>
<tr>
<td>Constant</td>
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<td>.09</td>
<td>.41 (.64)</td>
<td>-</td>
<td>.85</td>
<td>.81</td>
<td>.89</td>
<td>.86</td>
<td>.85</td>
<td>.70</td>
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<td>Perceptual Thinking Index</td>
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<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.2</td>
<td>.70</td>
<td>.48 (69)</td>
<td>.07** (.26)</td>
<td>.84</td>
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<td>.74</td>
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</tr>
<tr>
<td>Scale 6 (Pa)</td>
<td>.05</td>
<td>.04</td>
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</tr>
<tr>
<td>Scale 8 (Sc)</td>
<td>.04*</td>
<td>.03</td>
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<td></td>
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</tr>
<tr>
<td>Bizarre Mentation</td>
<td>.09*</td>
<td>.03</td>
<td></td>
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</tr>
<tr>
<td>Goldberg Index</td>
<td>.02*</td>
<td>.01</td>
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</table>

*Notes.* Non-K corrected raw scores were used to compute Pa, Sc, and BIZ, while K-corrected T-scores were used to compute the Goldberg Index. OCC = Overall correct classification; SENS = Sensitivity; SPEC = Specificity; PPP = Positive predictive power; NPP = Negative predictive power. *$p < .05$. **$p < .001$. 
CHAPTER 5
DISCUSSION

The goals of this study were to examine the effect of test interaction styles on the relationships between the MMPI-2 and Rorschach as well as to investigate the incremental validity of the MMPI-2 and the Rorschach on psychotic-related indices. Based on the results, grouping patients according to test-interaction style, in the form of being either dilated or constricted when responding to the task, had minimal impact in the predicted direction on the level of convergence between the MMPI-2 and Rorschach. When test interaction styles were ignored, there were modest significant correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI. Similarly when patients approached each test with a similar style, there were modest significant positive correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI. When patients approached the test in an opposing manner, the MMPI-2 scales and the Rorschach variables tended to be negatively correlated. Despite significant correlations between the MMPI-2 Sc and BIZ scales and the Rorschach PTI, these correlations were small in magnitude, and were not consistent with those reported by Meyer et al. (2000) and Lindgren and Carlsson (2002).

Overall, the lower correlations in this study may be a consequence of having a relatively small sample size, low reliability estimates, and/or lack of validity of the classification of patients based on their test-interaction style. In this study, test interaction styles were determined by using a combination of two criteria sets. Any subjects identified as having similar style by factor scales (i.e., R-Engagement and A), or by profile criteria were considered as having a similar style across methods. Concurrently, any subjects identified as having an opposing style by factor scales or by profile criteria were considered to have an opposing style across methods. The combination of these two criteria sets may have impacted the sample distributions. In other words, it is possible that in Meyer et al.’s (2000) and Lindgren and Carlsson’s (2002) studies, they employed subjects with more extreme test interaction styles which would lead to a greater impact on intermethod convergence. The low levels of convergence may also be a result of the reliability of the MMPI-2 scales which were found to range from .56 - .79. To the extent that the reported reliability of the MMPI-2
scales was an underestimation of the true reliability, the strength of hypothesized associations with other measures is expected to be increased.

Initial analyses revealed that the MMPI-2 variables as well as the Rorschach PTI were able to distinguish patients diagnosed with a primary psychotic disorder from those that were diagnosed with a primary mood disorder without psychotic features. The PPD group scored significantly higher than the PMD group on the Rorschach PTI. This is expected given that the PTI consists of variables that assess implausible relationships, illogical or circumstantial thinking, and dissociated or distorted thinking (Exner, 2000b). The PPD group also scored higher than the PMD group on PTI Criteria 1, 2, and 5, with Criterion 5 having the largest effect size. Based on the effect sizes for the different PTI criteria, the variables assessing form quality performed better in this sample at differentiating PPD and PMD groups than the variables measuring cognitive special scores. On the MMPI-2, the PPD group scored significantly higher than the PMD group on the Clinical scales Pa and Sc, on the Content scale BIZ, as well as on the Goldberg Index. These scales tap different aspects of a psychosis (e.g., unusual and atypical experiences, bizarre thought processes, social alienation, peculiar perceptions, suspiciousness, interpersonal sensitivity, persecutory ideas, and moral self-righteousness, hallucinations, and delusions of persecution). Across instruments, differences between the PPD and PMD groups produced moderate to large effect sizes for significant MMPI-2 variables and for the Rorschach PTI.

On its own, the PTI showed a better overall classification rate than the MMPI-2. The PTI was able to correctly classify PPD and PMD patients 84% of the time as compared to 70% when the MMPI-2 variables were used. To assess the clinical utility of the MMPI-2 and Rorschach in differentiating psychotic patients from nonpsychotic patients, diagnostic efficiency statistics were computed at each block of the hierarchical regression analyses. When the MMPI-2 variables were entered first into the analyses, diagnostic efficiency statistics indicated that the addition of the Rorschach PTI contributed to the prediction of group membership above what was predicted by the MMPI-2 variables. When the Rorschach PTI was entered first into the analyses, diagnostic efficiency statistics showed that the MMPI-2 scales were not able to add to the predictive capacity of the Rorschach PTI.
The MMPI Clinical Pa, Sc, and Content BIZ scales consist of items that assess areas such as bizarre thought processes, peculiar perceptions, social alienation, poor family relationships, concentration, suspiciousness, interpersonal sensitivity, hallucinations, and delusions of persecution. The present results suggest that the areas tapped by the MMPI are already being assessed by the Rorschach PTI. Alternatively, the Rorschach PTI appears to be measuring additional symptoms common to psychosis that are not being assessed by the MMPI. One can speculate as to the additional variance being accounted for by the Rorschach. It is possible that the response style of the Rorschach accounts for this difference. When subjects are limited to True or False responses, there are some natural boundaries inherent in the structure imposed by the test. Alternately, when subjects are allowed free responses, there is a loosening of boundaries, and circumstantial thinking, unconventional reasoning, and deviant verbalizations may be more likely to emerge. Information obtained by the MMPI-2 is dependent on the quality of individual’s conscious self-schema (Meyer, 1997), whereas information obtained by the Rorschach is not dependent on conscious awareness. Therefore, it is speculated that the PTI score is more likely to capture additional characteristics of psychosis.

There was an increase in the Nagelkerke $R^2$ from 41% to 48% but a decrease in OCC rate from 85% to 84% when the MMPI-2 variables were entered into the analysis after the Rorschach PTI. It is rare to see an increase in $R^2$ at the same time as a decrease in OCC so this finding deserves further discussion. One would expect that these two statistics would vary in the same direction. One can speculate that the inverse relation between these two statistics is due to the fact that, in relatively small samples, the Nagelkerke $R^2$ is not directly related to classification rates and that these rates can decrease even though the overall standard error of prediction is reduced by adding a predictor (G. J. Meyer, personal communication, June 27, 2006). One of the goals of logistic regression is to differentiate subjects into their respective groups. Thus, despite a decrease in diagnostic efficiency statistics, two findings suggest that there was better separation of PPD and PMD cases. A comparison of classification plots in Blocks 1 and 2 suggests that in Block 2 the model does a better job of discriminating subjects who have a relatively even chance of belonging in either the PMD or PPD group. A calculation of the proportion of cases with predicted probabilities ranging from .45 to .63
using just the Rorschach PTI and the complete model supports this assertion. The proportion of cases with predicted probability in this range when the PTI was used solely was .45. When both the MMPI-2 variables and Rorschach PTI was used, the proportion decreased to .15.

**Implications**

With respect to clinical practice, the results of the study suggest that the MMPI-2 and the Rorschach are distinct assessment methods. Given that both methods appear to demonstrate incremental validity over the other method (Rorschach more so than the MMPI-2 on psychotic-related indices), clinicians should consider both methods when they are interested in obtaining a broad understanding of their patients’ personalities because each method alone is incomplete and may provide a limited degree of information.

**Study Limitations**

Despite the positive results for the incremental validity of the Rorschach PTI over the MMPI-variables, a number of authors have cautioned against the concept of incremental validity (Anastasi, 1988; Wiggins, 1973; Hunsley & Meyer; 2003). According to these authors, conclusions about the incremental validity of a measure are context specific. In other words, the prevalence rate of a particular disorder may not generalize to other contexts in which the prevalence rate differs substantially. In situations when the prevalence rate is very low, a valid measure may demonstrate only modest incremental validity (Anastasi, 1988; Hunsley & Meyer; 2003). Furthermore, given that there is a greater chance of a false positive clinical diagnosis in contexts where the prevalence rates are low, the importance of examining other diagnostic efficiency statistics such as sensitivity and specificity becomes important. Based on the diagnostic efficiency statistics descriptions, the coefficients for sensitivity and specificity were determined independent of the base rate, or prevalence, of being diagnosed with PPD (Streiner, 2003). The coefficients for positive and negative predictive power, on the other hand, take into account the prevalence rate of being diagnosed with PPD in this particular sample. This distinction is important given that the present sample consisted of 46% of patients diagnosed with PPD and 54% of patients diagnosed with PMD,
percentages that may not be comparable to the full range of diagnoses encountered in an inpatient setting.

There are several other limitations to consider, the first of which involves the assigning of patients to either the PPD or the PMD groups. As suggested by others, when examining psychometric properties of tests using classical test theory techniques such as internal consistency measures, it is important to consider that the interpretations drawn from these analyses cannot be separated from the population being studied. Consequently, the somewhat restricted range of subjects utilized for this study might have reduced the internal consistency statistics. It is plausible that if a greater range of subjects (i.e., patients and non-patients) are utilized, improvements on internal consistency statistics would be observed. Second, although this study used the SCID-CV and SCID-II in diagnosing patients, this study failed to assess reliability of diagnoses using multiple raters. Third, the majority of patients in both the PPD and PMD groups had comorbid diagnoses, thus some caution is warranted in formulating interpretations pertaining to the true effects of thought disturbance of the PTI. Despite the limitation inherent when employing patients with comorbid diagnoses to examine one particular diagnostic group, this limitation can also be viewed as addressing the ecological validity of the study, given that a large number of patients in the clinical settings are diagnosed with co-occurring disorders (Kaplan & Sadock, 1998). Fourth, a number of studies have found that antipsychotic and antidepressant medications can affect neurocognitive domains such as attention, memory, and general executive and perceptual organization (Bilder et al., 2002; Dealberto, McAay, Seeman, & Berkman, 1997). Given the potential cognitive effects of psychotropic medications on patient functioning, the test scores might not reflect the true cognitive functioning of PPD and PMD patients. Fifth, there were a large number of patients who were on antipsychotic and antidepressant medications. To date, there has been little empirical work examining the effects of psychotrophic medications on test results.

Directions for Future Research

It would be valuable for future studies to examine the relationship between the MMPI-2 and the Rorschach on conceptually-related and unrelated test indexes. For instance, using a multitrait-multimethod approach, it is possible to examine the construct
of affective distress (e.g., MMPI-2 Scales 2 and 7 and the Rorschach DEPI index),
psychotic processes (e.g., MMPI-2 Scales 8 and BIZ and Rorschach PTI), and
interpersonal vigilance (e.g., MMPI-2 Scales 6 and the Rorschach HVI) to determine
both convergent as well as discriminant validity. It will also be useful for future research
to explore the incremental validity of the MMPI-2 and Rorschach among various groups
of patients (e.g., personality disorder cluster A, B, and C; see Hilsenroth et al., 1998) in
different treatment settings (e.g., outpatient setting). As stated earlier, the population
that a particular program serves (e.g., inpatient hospital, outpatient) will influence the
number of individuals who exhibit the signs and symptoms characteristic of those
diagnosed in the PPD group, thus, impacting the prevalence rate for PPD in that setting.
This is important to consider given that prediction of psychiatric disorder with low
prevalence rates often results in a high proportion of misclassification (Derogatis &
DellaPietra, 1994).
### APPENDIX A

**MMPI-2 Validity and Basic Scales (Greene, 2000)**

<table>
<thead>
<tr>
<th>VALIDITY &amp; BASIC SCALES</th>
<th>DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>L – Lie (15 items)</td>
<td>The L scale includes 15 items that were selected on a rational basis to identify persons who are deliberately trying to avoid answering the MMPI frankly and honestly (Dahlstrom et al., 1972). The scale assesses attitudes and practices that are culturally laudable but actually found only in the most conscientious persons.</td>
</tr>
<tr>
<td>F – Infrequency (60 items)</td>
<td>The F scale consists of 60 items that were selected to detect unusual or atypical ways of answering the test items. Unlike most of the other scales, the F scale was not derived by comparing item endorsements between criterion and normal groups; it is made up of items that no more than 10 percent of an early subsample of Minnesota normative sample answered in the deviant direction.</td>
</tr>
<tr>
<td>Fp – Infrequency Psychopathology</td>
<td>The Fp scale is</td>
</tr>
<tr>
<td>FB – Back Infrequency</td>
<td>The FB scale consists of 40 items on the MMPI-2 that no more than 10 percent of the normative sample answered in the deviant direction. This scale is analogous to the standard F scale except that the items are placed in the last half of the test.</td>
</tr>
<tr>
<td>Scale Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>K – Correction (30 items)</td>
<td>The K scale consists of 30 items that were empirically selected to assist in identifying persons who displayed significant psychopathology yet had profiles within the normal range.</td>
</tr>
<tr>
<td>? – Cannot Say</td>
<td>The ? scale consist of the total number of items that the clients omits, that is, fails to answer both <em>true</em> and <em>false</em>.</td>
</tr>
<tr>
<td>VRIN – Variable Response Inconsistency</td>
<td>The VRIN scale consists of 67 pairs of items that have similar or opposite item content. These pairs of items are scored if the client is inconsistent in his or her responses.</td>
</tr>
<tr>
<td>TRIN – True Response Inconsistency</td>
<td>The TRIN scale consists of 23 pairs of items. The TRIN is similar to the VRIN except that the scored response is either <em>true</em> or <em>false</em> to both items in each pair.</td>
</tr>
<tr>
<td></td>
<td>F - F_b</td>
</tr>
<tr>
<td>1 Hs – Hypochondriasis (32 items)</td>
<td>A wide variety of vague and nonspecific concerns about bodily functioning is tapped by the 32 items of Scale 1 (Hypochondriasis). These concerns tend to focus on the abdomen</td>
</tr>
</tbody>
</table>
and back, and they persist despite all reassurances and negative medical tests to the contrary. The Hs scale is designed to assess a neurotic concern over bodily functioning.

2 D – Depression (57 items)  The 57 items on D scale measure symptomatic depression, which is a general attitude characterized by poor morale, lack of hope in the future, and general dissatisfaction with one’s own status (Hathaway & McKinley, 1942). The major content areas within this scale include a lack of interest in activities expressed as general apathy, physical symptoms such as sleep disturbances and gastrointestinal ailments, excessive sensitivity, and lack of sociability (Dahlstrom et al., 1972).

3 Hy – Conversion Hysteria (60 items)  The 60 items of Scale 3 can be classified into two general categories: items reflecting specific somatic symptoms typically in the head, arms, and legs; and items that show that the client considers himself or herself well socialized and well adjusted. Although negatively correlated in normal individuals, they are closely associated in person whose personality revolves around histrionic dynamics.

4 Pd – Psychopathic Deviate (50 items)  General social maladjustment and the absence of strongly pleasant experiences are assessed by the 50 items of scale 4 (McKinley
& Hathaway, 1944). The major content areas of the items are diverse and in some cases contradictory. The items tap concerns about family and authority figures in general, self- and social alienation, and boredom. Other items assess the denial of social shyness and the assertion of social poise and confidence.

5 Mf-m – Masculinity-Femininity (Masculine) (56 items)

The 56 items comprising Scale 5 are very heterogeneous in content. The major content areas include interests in vocations and hobbies, aesthetic preferences, activity-passivity, and personal sensitivity.

5 Mf-f – Masculinity-Femininity (Feminine) (56 items)

The 56 items comprising Scale 5 are very heterogeneous in content. The major content areas include interests in vocations and hobbies, aesthetic preferences, activity-passivity, and personal sensitivity.

6 Pa – Paranoia (40 items)

Interpersonal sensitivity, moral self-righteousness, and suspiciousness are assessed by the 40 items that make up scale 6 (Paranoia). The content of some items is clearly psychotic, acknowledging the existence of delusions and paranoid though processes.

7 Pt – Psychasthenia (48 items)

The 48 items of Pt are designed to assess the neurotic syndrome of psychasthenia, which is characterized by the person’s inability to resist specific actions or thoughts regardless of their maladaptive nature. This diagnostic label is
no longer used, and such persons are now diagnosed as having obsessive-compulsive disorders. In addition to OCD features, scale 7 taps abnormal fears, self-criticism, difficulties in concentration, and guilt feelings.

8 Sc – Schizophrenia (78 items) Scale 8 consists of 78 items, which is 25 to 125 percent more items than in the other Clinical scales. The items assess a wide variety of content areas, including bizarre thought processes and peculiar perceptions, social alienation, poor familial relationships, difficulties in concentration and impulse control, lack of deep interests, disturbing questions of self-worth and self-identity, and sexual difficulties.

9 Ma – Hypomania (46 items) The milder degrees of manic excitement, characterized by an elated but unstable mood, psychomotor excitement, and flight of ideas are covered by the 46 items comprising Scale 9. The items rang over a wide variety of content areas including overactivity, both behaviorally and cognitively, grandiosity, egocentricity, and irritability.

0 Si – Social Introversion (69 items) The 69 items in Scale 0 (Social Introversion) were selected to assess the social introversion-extroversion dimension with high scores reflecting social introversion. The social introvert is uncomfortable in social interactions and typically withdraws from such interactions.
when possible. This individual may have limited social skills or simply prefer to be alone or with a small group of friends. The social extrovert is socially outgoing, gregarious, and seeks social interactions. Item content on this scale reflects personal discomfort in social situations, isolation, general maladjustment, and self-deprecation.
## APPENDIX B

**MMPI-2 Content Scales (Greene, 2000)**

<table>
<thead>
<tr>
<th>CONTENT SCALES</th>
<th>DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANX – Anxiety (23 items)</td>
<td>The primary theme in the ANX scale is generalized distress and negative emotionality that has an anxious flavor. Specifically anxious features will dominate the clinical presentation only when the ANX scale is elevated clearly above other first-factor measures of generalized distress and negative emotionality.</td>
</tr>
<tr>
<td>FRS – Fears (23 items)</td>
<td>High scores on the FRS scales have excessive fearfulness of objects and circumstances in their environment. They generally are apprehensive, anxious, and easily frightened. They also may have more specific phobic concerns and somatic symptoms.</td>
</tr>
<tr>
<td>OBS – Obsessiveness (16 items)</td>
<td>High scorers on the OBS scale have overly busy but massively inefficient cognitive processes. Their decision-making processes become bogged down in detail, but this indecisiveness seems to occur against a backdrop of timidity, if not dread, when faced with the necessity of taking practical action. They are insecure, anxious, and depressed.</td>
</tr>
<tr>
<td>DEP – Depression (33 items)</td>
<td>High scorers on the DEP scale report despair</td>
</tr>
</tbody>
</table>
and a loss of interest, and feelings of fatigue, apathy, and exhaustion. They are unhappy, blue, and quick to cry. They show a collapse in self-efficacy and self-regard to the point that they feel guilt-ridden, useless, unpardonably sinful, and condemned. They feel hopeless and contemplate suicide.

**HEA – Health Concerns (36 items)**

High scorers on the HEA scale are reporting a number of gastrointestinal symptoms and neurological symptoms. The clinician should determine how frequently clients have these symptoms and whether a physician has evaluated them recently.

**BIZ – Bizarre Mentation (23 items)**

High scorers on the BIZ scale are reporting a variety of overtly psychotic symptoms. These psychotic symptoms should be readily apparent on even casual interactions with the client and they are very likely to be the reason that the client is being seen for treatment. High scorers on the BIZ scale, especially when this elevation is primarily the result of the elevation of the BIZ1 scale, have impaired insight, an inability to enter into collaborative relationships, and a grandiose sense of having been selected or appointed for a secret and lofty mission or endowed with special powers. They also report strange, puzzling ideas and experiences that are not overtly psychotic in and of themselves.
ANG – Anger (16 items) High scorers on the ANG scale have poorly controlled anger. They are irritable, volatile, and intolerant of frustration. They are prone to angry tirades and destructive outbursts that have the potential to hurt others and damage property. If constrained by external circumstances, they also express their anger in more controlled ways through frequent nagging, teasing, demanding, and being stubborn. High scorers frequently will report being a helpless spectator to their angry outburst. They disapprove of their own destructiveness, yet feel unable to stop themselves. High scorers on the ANG scale have a high urgency to express what they are experiencing, they are also described as being depressed, histrionic, and as having family problems.

CYN – Cynicism (23 items) High scorers on the CYN scale assert that others are to be distrusted because they act only in self-interest, resort to honesty only to avoid detection, and act friendly only because it makes others easier to exploit. They see life as a jungle in which they must be constantly on the lookout for any competitive advantage, because others will use any means at their disposal to claim such advantage for themselves if they are given the opportunity. They have no qualms about resorting to deception, hypocrisy, and manipulation to get
away with whatever they can. They justify their exploitive behaviors with the rationalization that others are equally selfish, dishonest, and amoral.

**ASP – Antisocial Practices (22 items)**
High scorers on the ASP scale are reporting a disregard for rules and social conventions coupled with a cynical perspective on the motives of others. They have little concern or empathy for others. They are prone to abuse substances and to engage in other risky behaviors. They may have a history of antisocial behaviors while they were in school.

**TPA – Type A (19 items)**
High scorers on the TPA scale have a pressured urgency to get things done and they become irritated when having to wait in line or are interrupted at their work. They want to get even with people who oppose or have wronged them, and they are pleased when these people get into trouble. They also are described as being depressed and having family problems.

**LSE – Low Self-Esteem (24 items)**
High scorers on the LSE scale feel less capable, less attractive, less self-confident, and generally less adequate than others. They feel so overwhelmingly incompetent and inferior to others that the independent management of their lives seems out of the question. They are anxious, pessimistic, insecure, and depressed.
<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOD – Social Discomfort (24 items)</strong></td>
<td>High scorers on the SOD scale seek to stay away from other people, whether individuals or groups, because they feel uneasy and awkward in such situations, and because they are happier being alone. They do not report feeling lonely. They see themselves as lacking social skills and being socially inept. They are described as being insecure, anxious, depressed, and pessimistic.</td>
</tr>
<tr>
<td><strong>FAM – Family Problems (25 items)</strong></td>
<td>High scorers on the FAM scale not only feel deprived and mistreated by their family, but appear to have acquired or augmented a set of dispositions that maintains more generalized antagonism toward others into adulthood. They are emotionally detached and alienated from family members. They are apt to be seen by others as immature and over-reactive people who harbor grave doubts about and deeply negative attitudes toward themselves, but who are equally mistrustful and disparaging of others.</td>
</tr>
<tr>
<td><strong>WRK – Work Interference (33 items)</strong></td>
<td>High scorers on the WRK scale are experiencing a wide variety of problems that interfere with their abilities to carry out their work responsibilities. They find it hard to concentrate on tasks and they give up easily in the face of adversity. There is a dysphoric quality that permeates their life and interferes with their work.</td>
</tr>
<tr>
<td>TRT – Negative Treatment Indicators (26 Items)</td>
<td>High scorers on the TRT scale are helpless and hopeless in the face of their seemingly overwhelming problems. They are apathetic, depressive, and impotent. They do not like to talk about their personal problems and are uncomfortable when they have to do so.</td>
</tr>
</tbody>
</table>
## APPENDIX C

Perceptual Thinking Index RCS variables

<table>
<thead>
<tr>
<th>Rorschach Variables and Indices</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALOG - Inappropriate Logic</td>
<td>ALOG coding is assigned whenever the person, without prompting, uses strained, unconventional reasoning to justify the answer.</td>
</tr>
<tr>
<td>CONTAM - Contamination</td>
<td>Represents two or more impressions that have been fused into a single response in a manner that clearly violates reality.</td>
</tr>
<tr>
<td>DR - Deviant Response (Level 2)</td>
<td>Assigned for answers that have a strange or peculiar quality because the person has injected wording that reflects a tendency to detach from, or to distort, the task at hand. A value of 2 is assigned to those answers, which reflect more severe instances of dissociated, illogical, fluid, or circumstantial thinking.</td>
</tr>
<tr>
<td>DV – Deviant Verbalization</td>
<td>Assigned to those answers in which an inapplicable word or words have been used.</td>
</tr>
</tbody>
</table>
| FABCOM - Fabulized Combinations (Level 2)                | Used to identify answers in which an implausible, or impossible, relationship is posited to exist between two or more objects. A value of 2 is assigned to those answers, which reflect more severe
instances of dissociated, illogical, fluid, or circumstantial thinking.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FQ(-)</td>
<td>Form Quality Minus The sum of minus form level responses.</td>
</tr>
<tr>
<td>FQ+</td>
<td>Form Quality Superior The sum of superior form level responses.</td>
</tr>
<tr>
<td>FQo</td>
<td>Form Quality Ordinary The sum of ordinary form level responses.</td>
</tr>
<tr>
<td>FQu</td>
<td>Form Quality Unusual The sum of unusual form level responses.</td>
</tr>
<tr>
<td>HVI</td>
<td>Hypervigilance Index Created to assess attitudes that affect the way in which concepts are formed.</td>
</tr>
<tr>
<td>INCOM</td>
<td>Incongruous Combination Used to identify responses in which one or more highly implausible, or impossible, features or activities are attributed to a single object.</td>
</tr>
<tr>
<td>M</td>
<td>Human Movement Determined to be effective in differentiating patients diagnosed with thought disorders.</td>
</tr>
<tr>
<td>M(-)</td>
<td>Distorted Human Movement Human movement responses with poor form quality</td>
</tr>
<tr>
<td>PTI</td>
<td>Perceptual Thinking Index The PTI consists of an array of 10 seemingly heterogeneous variables, each of which is reviewed against a criterion to determine if the finding is positive or negative.</td>
</tr>
<tr>
<td>R</td>
<td>Total number of responses.</td>
</tr>
<tr>
<td><strong>RawSum6</strong></td>
<td>Total number of special scores.</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>Sum Level 2 Special Scores</strong></td>
<td>Total number of Level 2 Special Scores.</td>
</tr>
<tr>
<td><strong>SCZI - Schizophrenia Index</strong></td>
<td>The SCZI index in the RCS was developed to assist in the evaluation of schizophrenia and related disorders (Viglione, 1999), in particularly in the four basic areas of inaccurate perception, disordered thinking, inadequate controls, and interpersonal ineptness.</td>
</tr>
<tr>
<td><strong>S-% - White Space Distortion</strong></td>
<td>The sum of minus form level white space responses.</td>
</tr>
<tr>
<td><strong>WDA%</strong></td>
<td>Dividing the sum of +, o, and u responses given to the W and D areas by the sum of all responses given to the W and D areas.</td>
</tr>
<tr>
<td><strong>WSUM6 -</strong></td>
<td>Weighted sum of the 6 Special Scores.</td>
</tr>
<tr>
<td><strong>X+%- Conventional Form</strong></td>
<td>The sum of conventional form level responses.</td>
</tr>
<tr>
<td><strong>X-% - Distorted Form</strong></td>
<td>The percentage of responses with poor form quality. The sum of distorted form level responses.</td>
</tr>
</tbody>
</table>
R-Engagement Scale was computed from the following sample statistics. First, descriptive statistics for RCS variables were obtained.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Shading Blends</td>
<td>236</td>
<td>.87</td>
<td>1.12</td>
</tr>
<tr>
<td>FY</td>
<td>236</td>
<td>.76</td>
<td>1.45</td>
</tr>
<tr>
<td>FC'</td>
<td>236</td>
<td>2.10</td>
<td>1.23</td>
</tr>
<tr>
<td>FC</td>
<td>236</td>
<td>2.35</td>
<td>.89</td>
</tr>
<tr>
<td>CF+C</td>
<td>236</td>
<td>3.12</td>
<td>2.10</td>
</tr>
<tr>
<td>Shading Blends</td>
<td>236</td>
<td>1.11</td>
<td>.921</td>
</tr>
<tr>
<td>m</td>
<td>236</td>
<td>5.61</td>
<td>1.89</td>
</tr>
<tr>
<td>R</td>
<td>236</td>
<td>20.1</td>
<td>10.01</td>
</tr>
<tr>
<td>S</td>
<td>236</td>
<td>2.45</td>
<td>2.11</td>
</tr>
<tr>
<td>FM</td>
<td>236</td>
<td>3.25</td>
<td>1.78</td>
</tr>
<tr>
<td>FV</td>
<td>236</td>
<td>.67</td>
<td>.46</td>
</tr>
<tr>
<td>W</td>
<td>236</td>
<td>9.63</td>
<td>3.56</td>
</tr>
<tr>
<td>MOR</td>
<td>236</td>
<td>1.16</td>
<td>1.45</td>
</tr>
<tr>
<td>M</td>
<td>236</td>
<td>5.93</td>
<td>2.89</td>
</tr>
<tr>
<td>LAMBDA</td>
<td>236</td>
<td>.8405</td>
<td>1.76</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>236</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Second, z scores for each variable were computed by subtracting the mean from the person's observed score and then divide by the standard deviation. (e.g., if someone scores a 5 on Morbid responses, their z score would be \([5 - 1.16] / 1.45 = 2.648\)). Once z scores were obtained, the R-Engagement scale was calculated by using z scores with the following weights: .436(Color Shading Blends) + .372(FY) + .325(FC') + .3(FC) + .3(CF + C) + .29(Shading Blends) + .29(m) + .29I + .27(S) + .24(FM) + .22(FV) + .21(W) + .19(MOR) + .18(M) - .24(Lambda).
APPENDIX E

K-Corrected T Score Values for Validity Scales in Group-Specific Samples

<table>
<thead>
<tr>
<th></th>
<th>PPD</th>
<th>PMD</th>
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<tbody>
<tr>
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<td>Infrequency</td>
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<td>69</td>
</tr>
<tr>
<td>K</td>
<td>49</td>
<td>55</td>
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</table>
REFERENCES


Meehl, P. E., & Hathaway, S. R. (1946). The K factor as a suppressor variable in the


BIOGRAPHICAL SKETCH

Tam K. Dao was born in Saigon, Vietnam. With his parents and two older brothers, he came to America when he was three weeks old. He obtained his Bachelor of Arts degree in psychology from University of Texas at Austin in 1999 and a Masters of Science degree in psychological services at the University of Pennsylvania in 2002. Tam Dao completed his doctoral training at Florida State University in 2007 in the Combined Program in Counseling Psychology and School Psychology.