ABSTRACT

Title of Dissertation: A COMPARISON OF THE MMPI-2 AND RORSCHACH INKBLOT TECHNIQUE IN ASSESSING SCHIZOPHRENIA

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The study examined the concordance of Rorschach and MMPI-2 variables relating to schizophrenia. 85 psychiatric inpatients were administered both the MMPI-2 and Rorschach. A profile analysis compared individuals who elevated on the Rorschach SCZI index to nonelevators. No significant profile differences were found using a SCZI index cutoff of 4. When more distinct SCZI index groups were created (≥ 5 vs. ≤ 2) the profiles were found to be significantly different (average MMPI-2 profile for elevated SCZI group = 8-6-7) and the elevated SCZI group evidenced higher MMPI scale scores overall. The 8-6-7 profile has been associated with schizophrenia in previous research. The sensitivity, specificity, and hit rate of both instruments in predicting clinical diagnoses were also calculated. The MMPI-2 demonstrated better sensitivity while the SCZI index yielded higher specificity; the combination of instruments produced the best hit rate. The study demonstrated a relationship between MMPI-2 and Rorschach variables related to psychosis.

A COMPARISON OF THE MMPI-2 AND RORSCHACH INKBLOT TECHNIQUE IN ASSESSING SCHIZOPHRENIA

by

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CHAPTER 1

INTRODUCTION

Overview of the Present Study

The Rorschach Inkblot Technique (Rorschach) and the Minnesota Multiphasic Personality Inventory (MMPI) are among the four most frequently used psychological measures (Piotrowski & Keller, 1989). According to the Society for Personality Assessment, the Rorschach and MMPI rank one and two, respectively, as the most widely used instruments (Graham, 1993). Both are commonly used to assess personality functioning and to derive psychological diagnoses (Archer & Krishnamurthy, 1993). In addition, both are the subject of voluminous research. A literature search of psychological abstracts in the past five years shows over 500 references each to the MMPI and the Rorschach.

Although both are widely used independently in research, there is a relatively small literature on the interrelationship of the two instruments. Archer and Krishnamurthy (1993) found fewer than fifty studies in fifty years on this relationship. Theoretical, methodological, and instrumental reasons, which will be reviewed below, have been cited for this gap (Archer & Krishnamurthy, 1993). The relationship of these two instruments is a particularly important issue for both

clinicians and researchers. Both are used to arrive at clinical diagnoses, yet the two instruments do not always yield similar diagnostic conclusions (Acklin, 1993; Weiner, 1993). The present study will examine the relationship of these two instruments with regard to a single diagnosis, schizophrenia. Previous research has focused on predicting diagnosis, rather than the areas of convergence and divergence in regard to a specific diagnosis or symptom cluster. Thus, the present study will compare in detail the relationship of the instruments in regard to schizophrenia, basing hypotheses on specific symptoms and issues relevant to schizophrenia.

The reasons for the instruments' disparity need further clarification. In a recent review of the conjoint use of both instruments, Weiner (1993) states that currently "there is no good reason to expect that Rorschach and MMPI variables will generally correlate with each other" (p. 149). In fact, correlations of as low as -.02 between MMPI-2 and Rorschach measures of schizophrenia have been reported (Scale 8 with SCZI index; Meyer, 1993). These results are puzzling given that both instruments purport to assess schizophrenic symptoms. Weiner goes on to suggest that similarities and differences between the measures can be used to

generate clinical and research questions. If the instruments are in fact assessing unique components of psychopathology, clinicians need to understand the benefits, purposes, and limitations of each and how to integrate the information to arrive at a diagnosis (Lovitt, 1993; Weiner, 1993). In addition, the information obtained from each can be used to enhance the refinement of clinical diagnoses for research purposes (Moldin, Gottesman, Rice, & Erlenmeyer-Kimling,1991). In some cases, it may be that one instrument is sufficient for diagnostic screening, while in others combining the two may enhance diagnostic validity (Walters, 1983).

A fruitful area for research with these instruments is the study of schizophrenia. Both the MMPI and the Rorschach are measures of people at risk for psychotic thought processes. However, both are limited in their ability to differentiate schizophrenia from other psychotic-spectrum disorders. The MMPI accurately identifies 60% to 90% of schizophrenics, and the Rorschach identifies 75-85% of schizophrenics (Exner, 1986a; Moldin, 1991; Patrick, 1988). Similar "false positive" rates of about ten percent are noted for both instruments (i.e., classifying non-schizophrenic patients as schizophrenic; Exner, 1991;

Graham, 1991). However, other research has indicated a false positive rate of up to 37% with the Rorschach (Exner, 1986b). Even more surprisingly, several studies have found no relationship between MMPI and Rorschach indices of schizophrenia (Archer & Gordon, 1988; Meyer, 1993). Part of the problem may be that neither directly measures DSM-III-R or DSM-IV criteria for schizophrenia, thus limiting the ability of either instrument to achieve a high concordance with DSM diagnosis. A second issue is that no study has examined the relationship of the two instruments in detail; that is, the concordance in assessing theoretically similar symptom clusters. Finally, much of the existing research demonstrates methodological problems.

Some authors suggest that combining the two instruments may enhance accuracy in diagnosing schizophrenia (Archer & Gordon, 1993; Weiner, 1993). A critical first step in the integration of these instruments is to understand the relationship between them and the unique contribution of each in assessing the symptoms associated with schizophrenia.

In order to begin to understand the complex relationship between the two instruments, the present study proposes to examine the interrelationship of

Rorschach variables and MMPI-2 variables in a psychiatric population. The variables compared will be those relevant to the assessment of schizophrenia, including variables representing disordered thinking, inaccurate perceptions, inadequate controls and interpersonal disruption (American Psychiatric Association, 1994). The subsequent pages include: (1) a description of both instruments; (2) information regarding the assessment of schizophrenia with each instrument; (3) current research documenting a Rorschach and MMPI relationship; and (4) a critique of research and methodological implications.

CHAPTER 2

Assessment with the MMPI and Rorschach

PsycLit and Medline searches (1985-1995) revealed 70 studies utilizing both the MMPI and Rorschach. However, the majority of these studies used the instruments as separate outcome/predictor variables. Comparing the measures was a focus of only eighteen articles. The dearth of literature relating the MMPI and Rorschach is in part due to the major theoretical difference between projective and objective personality assessment. The MMPI-2 is self-report, "objective" instrument which is statistically derived and highly structured, so that apparently there is little room for ambiguity. "Objective" personality instruments rely on conscious processing of information. Insight into internal experiences and self-awareness are required, as well as a willingness to accurately share what one believes about themselves (Meyer, 1993). The MMPI is considered to be an "objective", self-report personality measure.

The MMPI was developed in the early 1940's and quickly gained widespread use in personality assessment. However, lingering concerns about the standardization sample, outdated items and wording, and the omission of items led to a revision of the

instrument (MMPI-2) in 1989. The MMPI-2 is a 567 item true-false questionnaire. Combinations of items compose four validity scales, ten clinical scales, fifteen content scales, and numerous subscales, all reported in T-scores. The clinical scales were developed empirically from items which best differentiated a "normal" from a "clinical" population (Graham, 1993). Interpretation of the MMPI-2 is based on a profile of validity and clinical scales which are statistically deviant, or elevated. Table 1 contains a description of MMPI-2 scales (Graham, 1993).

Table 1

Description of MMPI-2 Scales

Scale	Description
Validity Scales	
? Cannot Say	The number of omitted items
L	Detects a deliberate attempt to present oneself in a favorable light (high T-scores) or respond honestly (average-low T-scores)
F	Measures deviant test-taking attitudes: high scores may indicate "faking bad", psychosis, or random responding. Low T-scores are interpreted in conjunction with other scales.
K	An index of subtle attempts to present oneself in either a favorable (high T-scores) or unfavorable (low T-scores) light. Average scores reflect a balance between positive self-evaluation and criticism.
Clinical Scales	
1	Somatic Concerns
2	Symptomatic Depression, including psychomotor retardation, lack of interest, dissatisfaction with life
3	Measures tendency to translate psychological concerns into physical symptoms

(table continues)

(Table 1 Continued)

Scale	Description
4	Attitude towards authority, antisocial acts
5	Traditionally masculine and feminine interests
6	Paranoid symptoms, mistrust of others
7	Taps anxiety symptoms, including doubts, fears, obsessions and compulsions
8	Measures psychotic symptoms, including delusions, hallucinations, social alienation, and bizarre thinking
9	Psychological and physical energy
0	Social introversion
Content Scales	
ANX	Anxiety
FRS	Fears
OBS	Obsessiveness
DEP	Depression
HEA	Health Concerns
BIZ	Bizarre Mentation
ANG	Anger

(table continues)

(Table 1 continued)

Scale	Description
CYN	Cynicism
ASP	Antisocial Practices
TPA	Type A Behavior
LSE	Low Self-Esteem
SOD	Social Discomfort
FAM	Family Problems
WRK	Work Interference
TRT	Negative Treatment Indicators
Selected Scale Subscales	
Scale 8:	
Sc1	Social Alienation
Sc2	Emotional Alienation
Sc3	Lack of Ego Mastery, Cognitive
Sc4	Lack of Ego Mastery, Conative
Sc5	Lack of Ego Mastery, Defective Inhibition

(developed from Graham, 1993)

The concept of projective assessment was articulated by Murray (1938) and is derived from Freud's concept of projection as an ego defense (Exner, 1986). Murray (1938) described projection as a natural process in which ambiguous perceptual inputs are interpreted in light of an individual's needs, interests, and overall psychological organization. Projective assessment is theorized to tap basic personality structure and unconscious dynamics by analyzing responses to unstructured stimuli (Hurt, Reznikoff, & Clarkin, 1991). The Rorschach was developed in light of theories of projective assessment (Exner, 1986). Unlike responses to the MMPI-2, responses to the Rorschach are not directly mediated by conscious schemata, but are thought to represent underlying personality structure and dynamics (Meyer, 1993).

It is noteworthy that the Rorschach Inkblot Technique was initially developed as a perceptual task, not a projective personality instrument, by Hermann Rorschach in 1921; however, it quickly became incorporated into the realm of projective personality assessment. By the 1960's, five major scoring systems existed. These systems were integrated and further developed by Exner into the Comprehensive System in

1974 (Exner, 1986a; Hurt, Reznikoff, & Clarkin, 1991). This system has integrated the perceptual and personality components of the Rorschach Inkblot Technique. Exner's Comprehensive System is currently the predominant scoring method for Inkblot responses. The system has demonstrated adequate validity, interrater reliability and test-retest reliability. (This system will be reviewed under METHODS, below.) A description of selected Rorschach Structural Summary Variables is located in Table 2 (Exner, 1986a).

Exner (1986a) highlights the schism created by this division of psychological instruments into projective and objective categories. He notes that it is assumed that projective measures are not psychometrically sound and rely solely on clinical interpretation of responses. Meyer (1993) adds that this bias has led to a preponderance of research in which projective instruments are validated using self-report personality instruments, such as the MMPI. He notes that in a psychiatric sample in which denial, limited insight, or over-reporting of symptoms is common, "it is a tenuous assumption to consider self-report scales to be the 'true' marker of a patient's condition," (Meyer, 1993, p. 172). He suggests that the interrelationship, or cross-validation of the two

Table 2

Rorschach Structural Summary Variables

Variable	Definition	Description
R	Number of Responses	interpret in conjunction with other data- (i.e., Lambda)
Lambda	# of form responses / Total R-pure Form R	willingness to become psychologically involved in a new stimulus (low Lambda = overinvolvement)
a:p	active:passive ratio for movement responses	ideational flexibility
Ma:Mp fantasy	active:passive ratio human movement responses	tendency to use (Mp>Ma+ 2)
X+%	proportion of conventional form responses for the record	perceptual accuracy
F+%	percent conventional form in pure Form responses	perceptual accuracy in form responses
X-%	proportion of poor form scores occurring in the record	degree of perceptual distortion
Xu%	proportion of unusual form perception in the record	unconventional perceptions

(table continues)

(Table 2 continued)

Scale	Definition	Description
S-%	proportion of distorted form in the white space responses	oppositional set
M-	sum of distorted human movement responses	distorted thought in relation to human
Zd	Sum of actual Z-scores minus estimated Z scores	efficiency of organization
Isolate/R	Bt+2Cl+Ge+Ls+2Na/R (Botany, Cloud, Geography, Landscape, & Nature Content)	social isolation
Egocentricity Index	3(Fr+Rf) + Sum (2)/R (Fr & Rf=reflection responses)	degree of self-inspection
SCZI	Schizophrenia Index	SUMMARY INDICES (see Table 3)
DEPI	Depression Index	
S-Con	Suicide Constellation	
HVI	Hypervigilance Index	

(developed from Exner, 1978, 1986, 1991a; Greenwald, 1990)

instruments be explored, and the unique contributions of each be understood, prior to using one measure to validate the other. Thus, this study is intended as cross validation in which the relationship of the two instruments will be examined, rather than using one to predict the other.

Research involving the interrelationship of thepredict the other. instruments is difficult to conduct for both theoretical and methodological reasons. The most cogent methodological reason is the lack of a standardized, uniform scoring system for the Rorschach prior to the development of the Comprehensive system in 1974. In a recent literature review, only six of the thirty-seven MMPI/Rorschach comparison studies used Exner's Comprehensive System to score the Rorschach (Archer & Krishnamurthy, 1993). The authors noted that most of these studies did not present information on interrater reliability of the Rorschach scoring system. In addition, many studies employed a large number of comparisons between the two instruments without clear theoretical background (e.g., correlations of the entire structural summary and all MMPI scales). These methodological problems make it difficult to understand the relationship between the two instruments (Archer & Krishnamurthy, 1993). To

address these concerns, the current study will utilize the Comprehensive System for scoring, and employ Exner's recommended levels of interrater agreement. In addition, a limited number of theory-based hypotheses will be tested and statistical power will be reported. As noted above, the present study will form limited hypotheses based on variables which represent symptoms of schizophrenia.

Theoretically, each measure taps different components of personality which do not directly represent DSM-III-R or DSM-IV diagnostic criteria (Archer & Krishnamurthy, 1993). This makes comparison studies of diagnostic validity with the Rorschach and MMPI-2 difficult theoretically and practically. For instance, each measure may tap different symptoms of schizophrenia. A detailed examination of the relationship is needed. Thus, this study will compare the diagnostic concordance of the instruments as well as the subscales and components which contribute to that conclusion. These comparisons will be include scores from each scale which are theorized to tap similar symptoms of schizophrenia. While neither measure directly inquires about DSM-III-R or DSM-IV criteria for schizophrenia (as would a structured interview,) each measure taps characteristics or

symptoms of schizophrenia as detailed by the DSM-III-R or DSM-IV (American Psychiatric Association, 1994; Archer & Krishnamurthy, 1993; Exner, 1986a). These symptoms of schizophrenia will be used to form hypotheses in the present study.

CHAPTER 3

DIAGNOSIS OF SCHIZOPHRENIA

The DSM-IV lists five characteristic symptoms of schizophrenia: delusions, hallucinations, disorganized speech, disorganized behavior, and negative symptoms (APA, 1994). Two or more need to be present for a significant portion of one month to receive a diagnosis of schizophrenia. In addition, the DSM-IV details social and occupational dysfunction as necessary for a diagnosis. This includes disturbed interpersonal relationships, work functioning, and self-care. The DSM-IV notes that symptoms of schizophrenia can be present in a wide range of psychiatric disorders (American Psychiatric Association, 1994). The following sections will review the utility of the Rorschach and MMPI in assessing these domains. It should be noted that the DSM-IV, as a categorical system, will not classify individuals who display some symptoms of schizophrenia or whose symptom clusters fluctuate (Walters, 1983).

Diagnosis with the Rorschach

Exner (1986a, 1991) posits that four symptoms of schizophrenia are measured on the Rorschach: inaccurate perceptions, disordered thinking, inadequate controls, and interpersonal difficulties. (Exner, 1986a). These

symptoms are related to the DSM-IV symptoms of hallucinations, delusions, disorganized behavior, and social and occupational dysfunction, respectively. Of these, Exner states that inaccurate perceptions and disordered thinking are the hallmark of schizophrenia and the symptoms which best distinguish it from other psychiatric illnesses (Exner, 1986a). He developed the Schizophrenia Index (SCZI) to measure the degree of disordered thinking and inaccurate perception an individual exhibits. The Schizophrenia Index was refined over a period of years by testing which Rorschach variables best discriminated "non-patients", "nonschizophrenic psychiatric patients", and "schizophrenic patients" (Exner, 1991). (The reader is referred to Table 3 for exact criteria for this index, as it will be described theoretically below).

The SCZI index includes three measures of inaccurate perceptions: (1) absence of accurate perceptions; (2) presence of inaccurate perceptions; and (3) inaccurate perceptions even in highly structured situations. The index also includes three measures of disordered thinking; two are cognitive slippage as expressed in language, the third is disordered thought in interpersonal perceptions. It is noteworthy that Exner based his hypotheses in theories

of schizophrenia but the actual index was empirically derived from normative information (Exner, 1986a). A score of four or greater on the SCZI accurately diagnosed 78 to 86% of individuals with schizophrenia, but results in a false positive rate of 11% (Archer & Gordon, 1988; Exner, 1991). (It should be noted that the researchers named below have worked independently from Exner and the Rorschach workshops).

Table 3

Rorschach Assessment of Schizophrenia

Construct	Exner SCZI index	Perry & Viglione Ego Impairment Index
Inaccurate perceptions	1. X+% < .61 and S-% <.41 OR X+% < .50 (Percent of conventional form)	1. Sum of Form Quality minus (FQ-)
	2. X-% > .29 (Percent of poor form)	
	3. Sum FQ- > Sum Fqu OR Sum FQ- > Sum (Fqo + FQ+)	
Disordered Thought	4. Sum Level 2 special scores > 1 AND FABCOM, level 2 >2	2. Weighted Sum 6 (WSUM6)
	5. Sum 6 special scores > 6 OR WSUM6 >17	
Disordered thought in interpersonal situations	6. M- > 1 or X-% >.40 (Poor form in human movement responses)	3. Sum M-
Failure of repression		4. Primitive contents (anatomy, blood, sex, fire, morbid, explosion x-ray, food, AG, MOR)
Object Relations		5. Poor:good human experience
Diagnosis of Schizophrenia	4 of 6 above criteria met	Each criteria multiplied by a factor weight; EII scores above indicate schizophrenia

(table continues)

(Table 3 cont.)

Rorschach Assessment of Schizophrenia

(Table 3 cont.)

Rorschach Assessment of Schizophrenia

Construct	Measurement
Additional constructs relevant to Schizophrenia	
Affective Dysregulation	FC:CF+C ratio, with CF+C >FC+1 (Form-Color responses:Color-Form Pure & Color responses)
Self-Perception	3r + (2)/R (r= number of reflection responses)

The SCZI indexes of individuals with schizophrenia change very little. Exner found a test-retest reliability of .80 from two days after admission to just prior to discharge (Exner, 1986b). He notes that the problem of "false positives" continues to be the major difficulty with the schizophrenia index (Exner, 1991). For instance, 14% of schizotypal personality disorders evidence an elevated SCZI index (Exner, 1986b). As expected, this false positive rate decreases as more stringent criteria for SCZI are used. In one study, the false positive rate decreased by 72% when a cut-off score of five (as opposed to four) was used (Exner, 1991).

Disordered thinking and inaccurate perceptions have been supported as the key variables in distinguishing schizophrenia from other psychiatric disorders. Exner (1986b) compared schizophrenic, schizotypal, and borderline disordered subjects on numerous Rorschach variables. SCZI index variables best discriminated schizophrenics from the other two groups. In addition, affective dysregulation (FC:CF+C) was also most prominent in the schizophrenic subgroup. Self-perception as measured by the egocentricity index ((3r+2)/R) was also markedly low in the schizophrenic subgroup. Exner posits that this lower egocentricity

score indicates negative sense of self (Exner, 1986b), and the hypothesis receives support from research demonstrating a significant correlation between the egocentricity index and self-esteem scales (Greenwald, 1990). Affective dysregulation and poor sense of self concur with DSM-III-R and DSM-IV symptoms of schizophrenia (American Psychiatric Association, 1994).

These two variables-- disordered thinking and inaccurate perceptions-- were also included in the Ego Impairment Index (EII), developed to assess symptoms of schizophrenia (Perry & Viglione, 1991). The EII is a 5-item Rorschach measure of observable disturbances in ego functioning (see Table 3 for description and comparison with SCZI). The variables include the assessment of reality, cognitive distortion, interpersonal difficulties, and the defensive failures which are the "hallmark of schizophrenia" (Perry, Viglione, & Braff, 1992). The five variables included in this index are taken in part from Exner's Comprehensive System: (1) perceptual inaccuracy; (2) disordered thinking expressed in language; (3) primitive (or "derepressed") contents; (4) disordered perceptions of others; and (5) the ratio of poor human experience to good human experience. Note that three of their criteria correspond to criteria on SCZI

(although SCZI is less stringent in that it provides alternative criteria). These authors found their scale to have a test-retest reliability of .78 over nine weeks. In addition, their measure correlated .74 with Exner's SCZI index and with scales 6, 8, 9 (which assess symptoms of schizophrenia) and the Ego-strength subscale of the MMPI-2. Nonsignificant correlations were found for the remainder of the MMPI-2 clinical scales. These results led the authors to conclude that the EII index tapped relevant dimensions of schizophrenia.

In a review of neurotic, borderline, and psychotic Rorschach profiles, Acklin (1992) suggests that psychotic individuals are characterized by diffuse identity integration, primitive defenses, and impaired reality testing. In translating these features to Rorschach structural summary variables, he combines the concepts of both Exner and Perry, Viglione and Braff. He suggests inaccurate perceptions (poor form), disordered thinking (special scores), primitive content, fragmented sense of self, expression of drive-laden material (such as Aggressive movement), will denote Rorschach records of psychotic individuals (see Table 3).

In sum, the above research indicates that the SCZI

index significantly discriminates individuals with schizophrenia from schizotypal and borderline patients (Exner, 1986b; 1991). In addition, the studies above found a specificity of .89 in diagnosing adolescents with schizophrenia, and a specificity of .78 to .86 in diagnosing adults (Archer & Gordon, 1988; Exner, 1991).

From these studies, it can be gathered that inaccurate perceptions and disordered thinking will be translated into poor form and special scores in the Rorschach records of schizophrenics (Acklin, 1992; Exner, 1986b; Perry, Viglione, & Braff, 1992). The authors reviewed above also suggest that affective dysregulation, disturbed sense of self, and disordered interpersonal perceptions/relationships will be more prominent in the Rorschach records of schizophrenic individuals. The SCZI index incorporates three of these relevant dimensions of schizophrenia. In fact, these dimensions correspond to the DSM-IV diagnostic criteria for schizophrenia, which includes disturbed thought content (delusions), disturbed perceptions (hallucinations), disorganized language, disorganized/dysregulated behavior, negative symptoms and disrupted social functioning in the list of characteristic symptoms. Thus, in the present research, the Rorschach variables will include SCZI,

affective dysregulation (FC:CF+C), and self-esteem (3r+2/R).

Diagnosis using the MMPI-2

Diagnosis of schizophrenia using the MMPI-2 is less nebulous. Scale 8 is intended to measure psychotic disturbances of thinking, mood and behavior (Graham, 1993). An elevated scale 8 in combination with any other scale or two scales suggests a diagnosis of schizophrenia. However, an elevated scale 8 is not pathognomic of schizophrenia (Wetzler & Marlowe, 1993). Additional diagnostic information can be gained from examination of profiles, subscales and validity scales.

In reviewing the research, it is noteworthy that a majority of studies have utilized the MMPI (original version), rather than the MMPI-2. However, there are reasons to believe that MMPI research results are applicable to the MMPI-2. These reasons include the high correlation of MMPI and MMPI-2 validity and clinical scales, similar to that obtained in test-retest studies with one instrument (Graham, 1993). Graham and colleagues (1991) report the congruence of one, two, and three-point configurations on the two instruments. The magnitude of this relationship is related to the elevation of the scale. (For instance, when the lowest scale in a two-point code is at least 5

T-score points above the next-highest clinical scale, the MMPI and MMPI-2 profiles agree 95 percent of the time (for men in the normative sample)). For at least a five point T-score difference, the MMPI and MMPI-2 percent agreement range from 81.6 (men in psychiatric sample) to 100 percent (women in psychiatric sample with 10 T-score points). The difference in the instruments results in less elevation on MMPI-2 profiles. The manual states that fewer patients achieve T-score elevation on the MMPI-2 than on the MMPI-original (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Thus, both instruments will be included in the review below.

The bulk of MMPI and MMPI-2 research has been on utilizing a single "high point" scale or combination of scales to predict diagnosis of schizophrenia (Walters, 1983). Like the Rorschach, the MMPI demonstrates an excellent ability to differentiate the psychotic spectrum of disorders from neurotic disorders and a normal population, particularly when using a profile rather than a single scale (Goldberg, 1965; Walters, 1983; Wetzler & Marlowe, 1993). However, it has had limited success in differentiating schizophrenia from other psychotic disorders. Existing research does support Scale 8 as being related to a diagnosis of

schizophrenia, but it may include "false positives" in diagnosis (Graham, 1990; Wetzler & Marlowe, 1993). For instance, the MMPI profiles of chronic pain patients are likely to evidence an elevated scale 8 although they are not psychotic (Moore, McFall, Kivlahan & Capestany, 1988).

The opposite is also true: the use of single scale or profile elevations may produce "false negatives" in diagnosing schizophrenia. Wetzler and Marlowe (1993) found that while over half of psychotic individuals produced an elevated Scale 8, this scale was equally elevated in the control group (i.e., other psychiatric groups). The use of a profile, rather than a single "high point" scale enhances the diagnostic specificity of the MMPI. Moldin and colleagues (1991) found that a combination of MMPI scales accurately labeled 90% of nonschizophrenic patients as such and 70% schizophrenic patients as such.

In sum, no single MMPI or MMPI-2 scale has demonstrated adequate specificity and sensitivity to schizophrenia (Moldin, Gottesman, Rice, & Erlenmeyer-Kimling, 1989; Walters, 1983). However, combination of scales have improved predictive validity in diagnosing schizophrenia. In particular, the 68/86 profile is considered pathognomonic of schizophrenia, and has

demonstrated the best relationship to a diagnosis of schizophrenia (Walters, 1988; Wetzler & Marlowe, 1993; Winters, Newmark, Lumry, Leach, & Weintraub, 1985). Walters (1988) reports that this combination of scales significantly discriminated schizophrenia and affective disorders. However, while good specificity have been reported for the scales (ranging from .78-.90), sensitivity has been lower (.44-.70) (Archer & Gordon, 1988; Moldin, Gottesman, Rice, & Erlenmeyer-Kimling, 1991; Patrick, 1988; Wetzler & Marlowe, 1993). It has been recommended that the MMPI be used as a screening measure for psychotic disorders, rather than a litmus test for schizophrenia (Wetzler & Marlowe, 1993). In part, this is due to limited knowledge of the MMPI's ability to assess symptoms associated with schizophrenia.

While the above studies indicate the MMPI is valid for diagnosing schizophrenia in general (although sensitivity is generally poorer than specificity), the ability of the MMPI to assess specific symptoms of schizophrenia have not been widely investigated. Harris and Lingoes (1955,1968) developed subscales to tap symptom clusters: scale 8 has five subscales relevant to psychosis. (The reader is referred back to Table 1 (p. 8) for a description of these

subscales.) Despite the widespread clinical use of these subscales to interpret the MMPI, few studies have examined the relationship of these subscales to specific symptoms (Graham, 1993). The hypothesized relationship of these subscales to clinical symptoms are summarized in Table 4. Thus far, there is limited empirical support for the external validity of these subscales (Graham, 1993). However, the available evidence suggests that these subscales may be beneficial in understanding why a particular clinical scale is elevated. Walters (1988) suggests that the subscales may distinguish positive and negative symptoms, and that specific subscale profiles can add diagnostic validity. This idea receives support from a comparison of chronic pain and psychotic patients with an elevated scale 8. Moore, McFall, Kivlahan and Capestany (1988) found that psychotic patients reported significantly greater social alienation, bizarre thought processes, disturbed thinking, greater depression and despair than chronic pain patients. In contrast, both groups reported a similar amount of bizarre sensory experiences. In this case, subscale examination distinguished the two groups.

Table 4

MMPI Assessment of Schizophrenia

Construct	MMPI Scale
inaccurate perceptions	Lack of ego mastery, cognitive (Sc3)
disturbed thought	Bizarre sensory experiences (Sc6) Bizarre Mentation (BIZ)
interpersonal isolation/ disruption	Social Alienation (Sc1) Social Isolation (Scale 0)
Affective Dysregulation	Defective Inhibition (Sc5) Psychopathic Deviant (Sc 4)
Self Perception	Low Self-Esteem (LSE)
Diagnosis of Schizophrenia	Elevated scale 8 suggests schizophrenia; 6-8, 8-9 or 8-7-6 combination

(developed from Graham, 1993; Moore, McFall, Kivlahan & Capestany, 1988)

The MMPI content scales may also contribute information relevant to the diagnosis of schizophrenia. The content scales were developed from a combination of rational and statistical selection to assess content dimensions of MMPI statements. Because the content items contain "obvious" content, Graham suggests that elevated content scales represent areas that examinees want to communicate directly. One content scale relevant to this study is Bizarre Mentation (BIZ), which measures psychotic thought processes, hallucinations, paranoia, and delusions. It correlates .62 with scale 8, and .51 with scale F (Butcher, Graham, Williams, & Ben-Porath, 1990). Ben-Porath and colleagues (1991) investigated the content scales which best differentiated schizophrenia from depression in an inpatient setting. They found that bizarre mentation added to the diagnostic discriminative validity for both males and females. Dwyer, Graham, and Ott (1992) found that elevated BIZ scores in psychotic patients was significantly related to hallucinations and unusual thought content. These studies suggest that the BIZ content scale may be a useful measure of schizophrenic symptoms.

In sum, there has been limited research on the utility of MMPI subscales to assess specific dimensions

of schizophrenia. The BIZ content scale, along with the subscales for clinical scale 8, may add further information to interpretations of elevated 8, 6-8/8-6, or 8-9/9-8 profiles. Thus, in the present study, the MMPI variables will include 6-8-9 profiles, BIZ, and the scale 8 subscales. A major question will be the relationship of these subscales to Rorschach variables, which have received some support of a relationship to schizophrenia (Exner, 1991a, 1986b; Perry, Viglione & Braff, 1992). A related question is the degree to which the subscales add further information regarding why the MMPI does or does not relate to Rorschach variables.

CHAPTER 4

RESEARCH COMPARING MMPI-2 AND RORSCHACH VARIABLES

In sum, Rorschach research has centered on reducing the number of false positives; MMPI research has focused on the difficulty of false negatives, while increasing the number of "true positives", or improving the instrument's sensitivity. It may be that improving diagnostic accuracy may only occur by integrating the information from both measures.

Several authors have suggested that a combination of the Rorschach and MMPI will enhance diagnostic ability (Poreh & Whitman, 1993; Walters, 1983). Weiner (1993) advocates conjoint use of the instruments to increase the diagnosis of "true positives" and eliminate "false negatives". However, there have only been a few studies which examines the relationship of the instruments, a necessary first step in conjoint use of the measures (Walters, 1983; Weiner, 1993).

Studies which compared the MMPI-2 and the Rorschach in adults were reviewed by Archer and Krishnamurthy (1993). Of the fifty studies they included, only six were scored using the Comprehensive System; two of these were applicable to studies of schizophrenia. A review of the psychological literature since that time has revealed two additional

Rorschach/MMPI or MMPI-2 comparison studies relevant to the diagnosis of schizophrenia. All research mentioned is briefly summarized in Table 5.

Archer and Gordon (1988) combined the MMPI and Rorschach in diagnosing schizophrenia in adolescents. The SCZI index was not related to MMPI scale 8 elevations. Two interesting findings came from this study. The first was the generally low sensitivity and specificity of each instrument for adolescents. The sensitivity of MMPI scale 8 (T-score greater than 65) in diagnosing schizophrenia was .62, specificity was .42. Utilizing a cut-off of 4 on the SCZI index of the Rorschach produced a sensitivity of .47 and a specificity of .73. These authors found that combining the scale 8 (MMPI) with an elevated SCZI index produced a sensitivity (identifying schizophrenics as such) of .85 and a specificity (accurately identifying controls) of .57. Combining the instruments resulted in increased accuracy in identification of schizophrenia, but also produced more false positives than the Rorschach alone.

Perry, Viglione and Braff (1992) compared the EII, a scale similar to SCZI, to the MMPI-2. They found the EII to correlate significantly with scales 6 (r=.47), 8 (r=.41), and 9 (r=.49) on the MMPI-2, which was

hypothesized. Nonsignificant correlations were found for the remaining scales. They concluded that the EII taps psychotic processes. This study tested a limited number of theoretical hypotheses.

An extensive comparison of the MMPI-2 and Rorschach was undertaken by Meyer (1993). Using 90 inpatient adults, he first examined the effects of response frequency (R) on the Rorschach diagnostic indices (including the SCZI Index). He found that R was significantly related to "virtually all" of the criteria needed for the constellations. While R was not related to the SCZI index overall, it was significantly related to three of the six criteria

Table 5

Summary of Studies Comparing Rorschach and MMPI variables

Author (year)	Subjects	MMPI Scale	Rorschach Variable	Results
Exner, Armbruster, & Mittman (1978)	40 adults	K	R	high K scores related to low-R, indicating defensiveness
Archer & Gordon (1988)	134 adolescent inpatients	8	SCZI	SCZI>=4 combined with scale 8>=75 produced sensitivity of .85 & specificity of .57 in diagnosing adolescent
with schizophrenia				
Perry, Viglione, & Braff (1992)	34 inpatients & outpatients diagnosed with schizophrenia	All	Ego Impairment index (EII)	EII correlated with MMPI scales 6,8,9
Meyer (1993)	90 adult inpatients	All	All	SCZI not related to any MMPI-2 scales; covarying for R did not mediate relationship

(both special score criteria and a decreased X+%). He also correlated R with the clinical, content, and validity scales of the MMPI-2. He found that R was significantly related to only two scales of the MMPI-2: Scale 0 and Anxious Content (ANX).

Meyer then related the Rorschach constellations to all MMPI-2 scales, using response frequency (R) as a mediating variable. The SCZI index was not significantly related to any MMPI-2 scale. This result remained even when comparing the groups based on response frequency. This result supports Archer and Gordon's result in adolescents: that is, there was no demonstrated relationship between SCZI and scale 8. However, Meyer does not provide mean scores for these scales in his sample, making it difficult to understand what percentage of his sample elevated on either of these scales. In addition, he correlates only the total SCZI index with scale 8, rather than an MMPI-2 profile. Thus, it is difficult to understand the lack of relationship. Given that he found the SCZI index to be related to psychiatric diagnosis, the reasons for this non-finding become puzzling. Finally, Meyer tests a large number of hypotheses (over thirty), and performs numerous statistical tests, with a sample of 81 individuals.

A second interesting finding from the Meyer study is that R mediates the relationship between the MMPI-2 and Rorschach. He compared high, low, and medium response (R) groups to a variety of MMPI-2 scales. He found virtually no relationship between the MMPI-2 and the Rorschach indices overall. However, when these relationships were examined using high, medium, and low response groups, he found a number of relationships.

Meyer concluded that R is a dimension of openness, willingness, or ability to reveal symptomatology. In the low-R protocols, he found that MMPI-2 scales are unrelated or even contradict Rorschach constellations. For instance, in the low-R groups, elevated scores on the Depression Index (DEPI) were related to low T-scores on the MMPI-2 scale 2, which contraindicate depression. Meyer suggests the lack of concordance between self-report and projective assessment of depression is explained by an individuals' defensiveness, or unwillingness to report depressive symptoms. He suggests this is the concept tapped by R. Indeed, he found that in the high-R groups Rorschach variables were related to MMPI-2 scales in the expected direction. High-R individuals who were found to be positive on the Depression Index also had MMPI-2 elevations on Scale 2, Harris-Lingo Subscale D1, and

Depressive Content (DEP). Similar results were found with the Hypervigilant Scanning Constellation (HVI) and Obsessive Style Index on the Rorschach. While he noted a similar trend for the SCZI index, his sample size was too small to adequately test the hypothesis. Overall, these findings suggest that R is a measure of defensiveness which will affect the Rorschach/MMPI relationship.

The theory that R is a measure of openness is supported by earlier work by Exner and colleagues. Exner, Armbruster, and Mittman (1978) gave the MMPI and the Rorschach to 40 adults. It was hypothesized that the MMPI K scale and the number of responses on the Rorschach (R) would be related, as both are conceptually associated with defensive stance towards the assessment. This hypothesis was confirmed, as high K scores were associated with fewer responses.

As demonstrated above, there is a lack of research concerning the relationship between the MMPI or MMPI-2 and the Rorschach-Comprehensive System Scoring in adults. One study found no significant relationship between SCZI and any MMPI scale. A second found no relationship between the SCZI and the MMPI scale 8 in adolescents. If both measures purport to measure symptoms associated with schizophrenia, one must

question why there is no demonstrated relationship. Methodological reasons have been cited as contributing to the lack of relationship. Most of the research reviewed did not include R as a covariate, and this may partially contribute to this lack of results (Archer & Krishnamurthy, 1993; Meyer, 1993). Available information suggests that the Rorschach R is indeed an indication of defensiveness and approach to testing, and is related to the MMPI K-scale score (Exner, 1978). In addition, R is related to many Rorschach indices, and mediates the relationship between the MMPI clinical scales and these indices (Meyer, 1993). A second methodological problem is that many of the studies reviewed have tested a large number of hypotheses with small sample size (i.e., insufficient power), making it difficult to state that a lack of relationship exists (Archer & Krishnamurthy, 1993). For instance, Meyer performed over 60 statistical tests with his 90 inpatients. Some authors hypothesize that these measures may be unrelated in that each taps different aspects of personality, but call for additional research on the two instruments before drawing conclusions (Archer & Krishnamurthy, 1993; Meyer, 1993; Weiner, 1993).

The present study intends to improve upon previous

MMPI-2 and Rorschach research in several ways. First, this study will compare the Rorschach and MMPI-2 directly in adult inpatients. Only one other study (Meyer, 1993) directly compared these two instruments in adults, and the sample of patients is unclear in Meyer's study. Presently, the sample will be limited to adult inpatients. Second, previous research has utilized single scale elevations, which demonstrate a poorer relationship to schizophrenia (see previous sections). The present study will utilize MMPI-2 profile configurations, a more sensitive predictor of schizophrenia. These profiles will be compared to the overall SCZI index score. Third, the study will limit the number of hypotheses tested and will ground these hypotheses in the theory and research reviewed above. Finally, the study intends to explore the areas of concurrence and divergence for the two instruments, based on specific symptoms of schizophrenia.

CHAPTER 5

HYPOTHESES

Hypotheses of the Present Study

The hypotheses of the present study are summarized in Table 6. The main hypothesis of the present study is that the SCZI index is related to MMPI-2 profiles in adult inpatients. Specifically, individuals with an elevated SCZI index (indicative of schizophrenia) are expected to have elevated F, 6, 8, and 9 MMPI scales relative to individuals with a non-elevated SCZI index. MMPI scales which will be included in the analysis are the other validity scales (L and K) as well as scale 2 (depression). No specific hypotheses are made regarding these scales. In addition, the MMPI subscales are expected to be related to specific components of the SCZI index. That is: (1) the special score criteria is hypothesized to be related to Bizarre mentation (BIZ) and lack of ego mastery, cognitive (Sc3) on the MMPI; and (2) distorted human movement is hypothesized to be related to Scale 6 (Paranoia) on the MMPI-2.

Two components not tapped by the SCZI index, but which have shown some relation to schizophrenia, are affective dyscontrol and low self-esteem (Exner, 1986b). Affective dyscontrol is measured on the

Rorschach in the color ratio FC:CF+C. Ratios in which the right side (CF+C) is significantly greater than the left indicates difficulty in modulating affect. On the MMPI-2, scale 4 (antisocial acts, acting out) and scale 9 (psychological energy) tap similar concepts. In addition, subscale 5 (defective inhibition) measures inability to control one's emotions and acts. Thus, it is expected that unbalanced, right-sided ratios will be related to elevated scales 4 and 9, and Sc5, defective inhibition.

Low self-esteem as measured by the degree of self-inspection (3r+2/R) was found to be related to schizophrenia (Exner, 1986b). Low self-esteem is measured directly by the MMPI-2 content scale, Low Self-Esteem (LSE). Thus, it is hypothesized that lower 3r+2/R scores will be related to elevated LSE scales.

The final hypothesis will test the assumption that R and Lambda variables on the Rorschach are a measure of defensiveness will be examined. Elevated Lambda and a low number of responses is hypothesized to be related to an elevated MMPI K scale. No specific hypotheses are made regarding the relationship of R and Lambda to the other MMPI validity scales, L and F.

While the main focus of this research is to explore the relationship of the MMPI and Rorschach in

diagnosing schizophrenia, a natural next step in this line of research is to relate these measures to clinical diagnosis. Thus, in a subsample of the current population (see METHODS, below) the relationship of each of these instruments to a diagnosis of schizophrenia will be examined. Specifically, the SCZI scores and MMPI profiles will be compared for individuals diagnosed with a psychotic disorder (schizophrenia, schizophreniform disorder, psychosis not otherwise specified, or delusional disorder) versus individuals with another diagnosis. This comparison is intended to lend information to the above analyses. That is, this analysis will begin to explore the dimensions of schizophrenia each instrument measures. The sensitivity and specificity of each measure will be reported.

Table 6

Hypotheses of Present Research

Hypothesis
I. Overall difference in MMPI-2 profiles
Individuals who score on the SCZI index is 4 or greater will demonstrate MMPI-2 profiles with elevated F, 6, 8, and 9 scales relative to individuals with a SCZI score of 3 or less. No hypotheses are predicted regarding scales L,K, and 2, although they are included in the present study.
Subanalyses: Post-hoc contrasts will be carried out if the overall *F* is significant. In addition, the six components of the SCZI index will be correlated with the MMPI scales 6 and 8 and their associated Harris-Lingoes subscales to understand the source of the relationship.
II. Specific constructs
A. Defensiveness Individuals with elevated Rorschach Lambda and low R will have elevated K scales
B. Affective Dysregulation Unbalanced Rorschach color ratios (CF + C > FC+1) will be related to elevations on MMPI-2 scales 4, 9
C. Self-esteem Low scores on the Rorschach egocentricity index (3r + (2)/R) ratio will be related to elevated MMPI-2 Low Self Esteem Scale
D. Interpersonal Isolation/Paranoia Elevated M- will be positively related to an elevated Scale 6

CHAPTER 6

METHODS

Participants

There are two groups of subjects in the present research. The first group consists of archival data (54 inpatients at Temple University Hospital referred for psychological assessment who were administered both the MMPI-2 and the Rorschach Inkblot Technique). The second group of subjects consists of thirty-one new participants. A weekly staff meeting was held in which all current patients were reviewed and possible participants were identified. These individuals were then approached by an examiner and asked to participate (see consent form, Appendix A). During this meeting, some individuals were identified as requiring psychological assessment for treatment purposes. As the Rorschach and MMPI-2 are administered as part of a full diagnostic battery, these protocols were included in the study as well. Mean (standard deviation) age was 33.9 (11.19) and education was 11.9 (2.57); Table 7 presents demographic information for the entire sample.

The full sample (85 individuals) was divided into two groups based on the SCZI index elevation (elevated group index >/= 4, nonelevated group index <4). Mean (standard deviation) age for the low SCZI group was

Table 7

Demographic Information for Current Sample

Variable	Frequency[a]	Percent
Gender		
Female	51	60.0
Male	34	40.0
Race		
African-American	43	50.5
Caucasian	31	36.5
Hispanic	9	10.5
Asian-American	1	1.2
Arab	1	1.2
Occupation		
Not in labor force	51	60.0
Unskilled worker	8	9.4
Semi-skilled worker	8	9.4
Skilled workers	3	3.5
Managers, clerical	10	11.8
Professional	5	5.9
History of Significant Alcohol Use		
Yes	27	31.8
No	53	62.4
Unknown	5	5.9
History of Drug Use		
Yes	31	36.5
No	49	57.6
Unknown	5	5.9

[a] $n=85$

Table 8

Demographic Information for SCZI groups

Variable	Low SCZI[a] (SCZI < 4) Percent	Elevated SCZI[b] (SCZI =>4) Percent
Gender		
Female	61.1	58.1
Male	38.9	41.1
Race		
African-American	44.4	60.0
Caucasian	40.7	30.0
Other	14.8	10.0
Occupation		
Not in labor force	57.4	64.5
Unskilled worker	9.3	9.7
Semi-skilled worker	11.1	6.5
Skilled workers	3.7	3.2
Managers, clerical	14.8	6.5
Professional	3.7	9.7
History of Significant Alcohol Use		
Yes	33.3	29.0
No	62.9	61.3
Unknown	3.7	9.7
History of Drug Use		
Yes	35.2	38.7
No	61.1	51.6
Unknown	3.7	9.7

[a] *n*= 54 [b] *n*=31

35.3 (11.28) and high SCZI group was 31.5 (10.76). Mean education for low SCZI group was 11.6 (2.61) and the elevated SCZI group was 12.4 (2.47). The demographic information for these groups is presented in Table 8.

Finally, demographic characteristics of patients on the unit (including both participants and nonparticipants) were collected for five weeks during the study. Over a five week period, 58 patients were admitted to the unit with a mean age of 39.6. Fifty-four percent were admitted with a diagnosis of schizophrenia, 25% were admitted with affective disorder, 6% with bipolar disorder, 3% with other diagnosis, and 11% were undiagnosed at time of admission. Education information was not available for this group.

Procedures

The Rorschach was administered and scored by a clinical psychology intern or upper-level graduate student trained in the Comprehensive system (a complete description of examiners is provided in Results, p. 61). In addition, all protocols were reviewed and scoring checked by a senior faculty psychologist. The individual scoring the Rorschach was not aware of the MMPI-2 results; individuals other than the main

experimenter were not aware of the study's hypothesis. Hospital discharge summaries and inpatient records were obtained for 65 individuals, and an independent clinical diagnosis was made by a Ph.D.-level psychologist. This psychologist did not have access to any MMPI-2 or Rorschach data, and was not familiar with the cases prior to assigning diagnosis (a complete description of this process can be found in Results, p. 61). Both the Rorschach protocols and clinical diagnosis were checked for interrater agreement (see below).

Measures

MMPI-2. The MMPI-2 is a 567 item, true-false questionnaire which assesses a variety of pathological and psychological domains. The sum of answers to the true-false questions on each scale are converted to T-scores, and plotted on a profile (some scales use a K-correction). (Description of the MMPI-2 scales can be found in Table 2). The clinical scales were constructed by selecting items which differentiated groups of subjects. For instance, a item was selected for scale 2 (depression), if it differentiated depressed and non-depressed individuals, regardless of the item content (Dahlstrom & Dahlstrom, 1980). The MMPI-2, although a revision of the original instrument,

correlates highly with it. Raw scores on the clinical scales of both the MMPI and MMPI-2 are correlated at .98 or greater (Graham, 1993). Among psychiatric inpatients, sixty percent have the same two-point code type on the MMPI and MMPI-2 (Lachar, 1991). Graham (1993) cites studies such as these to argue that the reliability, stability, and validity of the MMPI-2 is comparable to the MMPI. This is necessary as there has been limited research on the psychometric characteristics of the MMPI-2.

The reliability of the MMPI-2 is reported in terms of the internal consistency of each validity and clinical subscale (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Alpha coefficients were reported for both men and women. The lowest reported coefficient for men was scale 6 (.34) and the largest was scale 8 (.85). For women, these coefficients ranged from .39 (scale 6) to .87 (scale 7) (Butcher, et al., 1989). In a meta-analysis of data presented in previously reported studies, average reliability coefficients of the original MMPI were found to be .84, with a 95 percent confidence interval of .83 to .85 (Parker, Hanson & Hunsley, 1988).

Stability of the MMPI-2 has been measured via test-retest intervals of one-two weeks in the normative

sample. Test-retest coefficients range from .67 (scale 6) to .92 (scale 0) for men and .58 (scale 6) to .91 (scale 0) for women. Lower reliability on some scales is expected because the scale represents a state variable (i.e., acute paranoia, scale 6), while trait variables (i.e, social isolation, scale 0) are less likely to change over time.

While research has not focused exclusively on the stability and validity of the MMPI-2 for individuals with schizophrenia, information for psychiatric patients is abundant; and this review will focus on the MMPI-2 scales relevant for schizophrenia.

No information regarding stability for psychiatric samples is yet available for the MMPI-2. However, test-retest reliability for the original MMPI has been measured in psychiatric samples. Coefficients were calculated for periods of less than one day, one to two weeks, and one year or more. As would be expected, one-day retests show the strongest correlations. However, the one-two week stability in psychiatric samples was reported to average between .80 and .85; over one year, these averages were .50 to .60 (Schwartz, 1977). Average stability of the MMPI was found to be .74 in a meta-analysis of the literature. However, these authors did not consider varying time

intervals between tests (Parker, Hanson & Hunsley, 1988).

The validity of the MMPI-2 has been investigated via behavioral ratings of subjects. Ratings were provided by each subject's partner. Graham (1993) notes that the pattern of correlates provides evidence for convergent and discriminant validity of the MMPI-2. For example, the behavioral rating "many fears" correlated significantly with scales 7 and 8 at $r=.21$. More relevant to this study, MMPI-2 code types were correlated with symptomatic descriptors provided by psychiatric patients' psychiatrists and psychologists. Graham (1993) reports these coefficients for both men and women; selections of his table relevant to the current study are reproduced in Table 9. Graham notes a different pattern for both men and women.

Parker, Hanson and Hunsley (1988) reported average convergent validity coefficients of the MMPI in the literature. It should be noted that their review included a variety of studies with different comparison measures. None-the-less, they estimated the average correlation coefficient in validity studies to be .46.

Table 9

Selected Validity Coefficients for the MMPI-2[a]

Scale	Rating-Scale Item	Correlation Coefficients	
		Men	Women
6-Pa	Suspiciousness	.02	.20
	Emotional withdrawal	-.02	.19
	Unusual thought content	.18	.05
7-Pt	Hallucinatory Behavior	.22	.09
	Grandiosity	-.22	-.27
	Guilt feelings	.21	.15
	Depressive mood	.18	.20
8-Sc	Suspiciousness	.04	.25
	Unusual thought content	.22	.02
9-Ma	Depressive Mood	-.17	-.05
	Conceptual disorganization	.15	.18

[a] selected reproductions from Graham, 1993, p.191

Rorschach Inkblot Technique. The Rorschach Inkblots were scored utilizing the Comprehensive System (Exner, 1976). In this system, responses to the inkblots are given scores in eight categories. This includes location, determinants, form quality, pairs, contents, popular response, organizational score, and special scores. The scores in these eight categories are tallied to produce approximately fifty scores, sums, ratios, and percentages. These scores, in turn, are considered to represent seven areas of functioning: ideation (conceptualization), mediation (translation of information), processing, controls and stress tolerance, affect, self-perception, and interpersonal perception.

In discussing issues of reliability, Exner (1986a) notes that traditional conceptions of internal consistency may not be applicable to the Rorschach. Measures of internal consistency, such as the split-half coefficient, are only appropriate when test items can be considered roughly equivalent. This assumption does not hold true for the Rorschach cards, which pull for different response sets (Exner, 1986a). Thus, reliability of the Rorschach has been examined solely in terms of interrater reliability and test-retest reliability.

Interrater reliability for each scoring category of the Comprehensive System has been reported by Exner (1986a). The following are percent scoring agreement for trained examiners: determinant coding, 88-98 percent agreement; special score coding, 94 to 99 percent agreement; form quality 93 to 97 percent agreement. In a meta-analysis of the literature, Parker, Hansen and Hunsley (1988) found the average reliability coefficient for the Rorschach to be .86. It is noteworthy that interrater agreement depends on the training of the coders. Temporal stability of the Rorschach has been studied in intervals from a few days to over three years. Exner (1986a) reports coefficients that exceed .80 for fifteen of twenty Rorschach variables over a one year period. He notes that the remaining five variables are considered trait, rather than state, measures, and are expected to change. Indeed, these results remain consistent after a three year period (Exner, 1986a), with the same five variables associated with lower coefficients. Of these five variables, two are relevant to the present study. The number of pure color and color-form responses show a temporal stability of .56 and .58, respectively. However, the number of form-color responses shows a temporal stability of .86.

Parker, Hansen and Hunsley (1988) report similar results, with an estimated overall stability coefficient of .85. In an earlier review, Parker (1983) found reliability to be linked to the power of the statistical test used and the theoretical basis of the comparison. Powerful statistics combined with a priori expectations produced reliabilities of .83. However, Parker did not detail the studies considered as "reliability" studies.

In the same meta-analysis, Parker (1983) estimated the external validity of the Rorschach to be between .45 and .50. This value is similar to a later meta-analysis which reported the convergent validity of the Rorschach to be .41 (Parker, Hansen, & Hunsley, 1988). Again, both reviews encompassed many studies with a variety of criterion measures.

Research has consistently validated the Rorschach in diagnosing schizophrenia. These studies have investigated both the SCZI index and its components. Adair and Wagner (1992) found no significant changes in special scores (WSUM6, cognitive slippage) over a six-year period. The test-retest reliability of the SCZI index was reported to be .80 (Exner, 1991). (Studies examining the reliability and validity of the SCZI index were reviewed in detail in the literature review,

above (p. 18)).

Vincent and Harman (1991) investigated the clinical validity of the Rorschach in differentiating schizophrenia, depression, and character disorders. Rather than calculating coefficients, they examined the ability of the Rorschach to differentiate these disorders. They utilized a design in which values two standard deviations above the mean (or top and bottom one percent) were considered to differentiate individuals with and without schizophrenia. They found that lambda, as well as four components of the SCZI index, clearly differentiated individuals with schizophrenia. These components included form quality (FQ-, X+% and X-%), and special scores (Weighted Sum 6 and raw Sum). They did not investigate the remaining two components of the SCZI (M- and level 2 special scores) (the reader is referred to Table 2 for abbreviations). These authors concluded that the Rorschach is valid for schizophrenia.

CHAPTER 7

RESULTS

Variables

Throughout the results section, abbreviations for Rorschach variables will be used, as well as a summary of the construct it measures. A more complete descriptions of all Rorschach variables is found in Table 2. Descriptive information for Rorschach variables is presented in Table 10. For comparison, normative information for inpatient schizophrenics reported by Exner (1991) is included in the table.

Normality. Rorschach variables fall into two broad categories: parametric and nonparametric. Several Rorschach evidence significant skewness and kurtosis, often with values clustering around one modal score, resulting in a "J" shaped distribution (Exner, 1992; Perry & Kinder, 1991). In addition, the summary indices, such as SCZI, are considered to be ordinal-level data (Meyer, 1993). Nonnormally distributed variables were analyzed using nonparametric statistics (Exner, 1992; Hays, 1988; Perry & Kinder, 1991).

All variables were examined for departures from normality. The significance of the skewness and kurtosis was evaluated using the procedure in Tabachnick and Fidell (1989). The skewness variable

was divided by its standard error, to obtain a z-value. This z-value was compared to a normal distribution; z-scores beyond 2.34 correspond to a $p<.01$. Seven Rorschach variables were found to exhibit significant skewness and were transformed: logarithmic transformations were utilized for R (# of responses), Lambda (involvement in the task), and es (psychological complexity), and square root transformations were utilized for EA (resources), WSUM6 (bizarre language), and Adjusted D (capacity for control). An inverse transformation provided the best adjustment for isolate/R (social isolation), although this variable remained slightly skewed (skewness=-0.93, standard error of the skew=0.261, significance of skew $p=.001$). Tabachnick and Fidell (1989) recommend using conventional, conservative levels for evaluation of skewness ($p<.001$); the significance of the skewness of isolate/R was equal to this level. It was used in the analyses, although caution should be exercised when interpreting the results.

In addition, four Rorschach variables were not considered to be appropriate for parametric statistics: M- (poor human movement responses), Fabcom-level 2 (cognitive slippage), S (white space responses), H (humans), and (H) + Hd + (Hd) (fictional humans and

human details).

MMPI-2 variables were also examined for skewness and kurtosis. (Table 11 presents descriptive information for MMPI-2 variables). Four variables (L,F,K, & subscale 2 of scale 8) evidenced either significant skewness or significant kurtosis. These variables were not transformed for three reasons. First, the significance of these variables was above the recommended level (p>.001; Tabachnick & Fidell, 1989). Second, these variables were to be included in the Profile Analysis, a multivariate procedure. Multivariate procedures are fairly robust to departures from normality when there are no outliers and the degrees of freedom for the error term is greater than 20, as in the present study (Tabachnick & Fidell, 1989). Finally, these variables were not transformed as the profile analysis requires all variables to be measured on the same scale. Transforming some MMPI-2 variables would make a profile analysis impossible to perform.

Table 10

Description of Rorschach Variables

Variable	Current sample		Inpatient[a] Schizophrenics	
	Mean	St. Dev	Mean	St. Dev.
R	20.0	6.77	23.4	8.66
Lambda	1.3	1.12	1.6	3.47
P	4.9	1.89	4.7	2.08
es	6.6	4.96	8.3	5.99
EA	5.8	3.94	8.6	5.39
D	-0.2	1.15	0.1	1.58
Adj D	0.2	0.98	0.7	1.45
WSUM6	15.1	18.21	44.7	35.40
Fabcom-2	0.3	0.65	1.8	2.04
M-	0.6	0.93	2.4	2.46
Afr	0.5	0.20	0.5	0.20
X+	0.5	0.13	0.4	0.14
X-	0.3	0.13	0.4	0.14
Zd	-1.8	4.20	1.3	4.93
Ego	0.4	0.19	0.4	0.18
S	1.3	1.46	2.8	2.49
H	2.4	1.90	3.2	2.44

[a] from Exner, 1991, pp. 83-84

Table 11

Description of MMPI-2 Variables

Variable	Mean T-score	St. Dev.
L	53.2	11.01
F	84.2	27.52
K	43.5	9.66
1 (HS)	65.8	14.21
2 (Dep)	69.5	14.88
3 (Hy)	62.5	14.55
4 (Pd)	69.7	15.08
5 (Mf)	56.0	9.93
6 (Pa)	73.9	20.42
7 (Pt)	72.4	18.50
8 (Sc)	79.8	19.14
9 (Ma)	61.6	13.30
0 (Si)	59.5	11.01

Interrater Reliability

Rorschach Scoring. Nineteen examiners (14 interns/post interns (including the main experimenter) and 5 practicum students) administered Rorschach protocols. Three individuals (two new interns and one prior intern) administered one protocol each. The average number of protocols administered by individuals other than the main experimenter was three. All protocols were numbered for each examiner, and the protocols to be rescored were selected through a random number generator. At least twenty percent of each individual's records were rescored, resulting in twenty-five (32% of all records) rescored protocols. Overall percent agreement for the categories fell within Exner's (1991) recommended level of interscorer agreement: location, 97.1%; determinants, 84.0%; form quality 86.8%; pairs, 97.2%; contents, 95.0%; populars, 98.0%; organizational activity, 87.0%; and special scores 83.9%.

In addition, agreement within each category was checked for each examiner. Disagreements between judges were reviewed by both judges, and cases where one judge had made a clear scoring error were corrected. Disagreements which could not be resolved were rescored by a third judge. In cases where

agreement was below the recommended level, a third judge rated the specific category for that record; this decision was final. Resolving disagreements was often a simple procedure in that one examiner made consistent errors (for example, see Z-score below). No examiner fell below the recommended 85% agreement for pairs, contents, or popular responses. One examiner fell below the recommended 85% agreement for location due to a poorly marked location sheet (location agreement for this examiner=75%).

Four examiners fell below the recommended 80% agreement for determinants, although three of these examiners reached 78-79.5% agreement. The fourth individual had 70% agreement for determinants. Examination of these four records for the source of difficulty revealed that 70% of disagreements involved the C', Y or T variables (achromatic color, shading, texture), which may be the most difficult to score; these variables do not factor directly on the SCZI index. An additional 18% of the disagreements involved movement responses. Accurate coding of movement responses is particularly important in the current study, as poor form quality in human movement responses is a criterion for the SCZI index. (This criterion was investigated in detail below.)

Special scores are likewise an important factor for the SCZI index. Three examiners fell below the 80% recommended level of agreement (71%, 79%, 79%). These records were examined in detail for sources of disagreement. The majority of disagreements (80%) involved special scores pertinent to the SCZI index. Half of these disagreements involved deviant verbalizations: (1) One record differed due to a relatively inexperienced scorer who conservatively assigned a Deviant Verbalization-level 1 score (which carries the lowest weight), or no score at all to each instance of special score. In this case, the Sum 6 (frequency of six special scores) was identical for both scorers, although the Weighted Sum 6 (WSUM6; special scores weighted by level of severity) differed by four points. (2) A second, similar instance resulted when a scorer did not assign any special scores. Three special scores (deviant verbalizations) were assigned by the second scorer, resulting in a WSUM6 of 3. (3) The third record with poor agreement was unusual in that the source of the disagreement centered on the assignment of PER (personalized) responses. The subject in this record told numerous personal stories, which was coded as PER by one examiner and as DR (deviant response, or tendency to

disengage from the task) by the second. In addition, these examiners disagreed on the assignment of a CONTAM response (fusion of two perceptions), which factors heavily on the SCZI index. The Sum 6 (frequency of special scores) for these examiners was close (5 and 3), but the weighted sum 6 was different (15 as opposed to 22), and resulted in a change in SCZI index elevation.

Four examiners fell below the recommended 85% agreement for the assignment of Z-scores. This was unexpected due to the high interrater agreement for location, which is the basis for Z-scores. In fact, only 13% of Z-score disagreements resulted from different location assignment. An additional 9% (3 errors) resulted from simple misassignment of Z-scores. Twenty-five percent of disagreements resulted from misinterpretation of the vague response, i.e, one examiner assigned a vague developmental quality and omitted Z-score. The largest source of disagreement (53%) reflected one examiner not assigning the highest Z-score possible. Typically, this was a response in which the subject used the whole blot (resulting in a W location) but broke the blot into adjacent details, (such as "two people touching") which yields a different Z-score. In this case, the highest Z-score

should be assigned (Exner, 1991); the Z-scores were simply corrected to comply with the rule.

Changes in SCZI index. All of the rescored protocols were checked for agreement in the SCZI index. In 64% of records the SCZI index did not change. Of those that did change, 44% were at the upper end of the index (a change of a 4-5 or a 5-6), and yielded an elevated SCZI index for both examiners. In four instances, disagreements resulted in a change in the SCZI index elevation. In two of these records, different assignment of form quality responses changed two criteria on the index, changing the elevation from a two to a four. The other two records changed from a three to a four as a result of special score assignment.

Changes in the SCZI index were evaluated whether or not the individual fell below the recommended interscorer agreement for the criteria composing the index. The procedure used to resolve disagreements in SCZI index elevation was the same as above: the two examiners resolved disagreements if possible, or a third judge rescored the record, this result was final. The final judging resulted in two of these records remaining elevated, and two remaining non-elevated.

Diagnosis. Medical records were available for 65

patients. An additional seven patients were involved in outpatient therapy prior to hospitalization and assessment; the diagnosis from their outpatient chart was utilized. DSM-IV diagnosis was assigned by two doctoral level psychologists based on the medical records of each client, including discharge summary and one week of hospital staff notes, based on the behavioral symptoms documented in the records. The first psychologist assigned diagnoses for the full sample; the second assigned diagnoses to twenty percent of records in order to check for agreement. Records were numbered; records to be reassessed were selected through a random number generator. Names, discharge diagnoses, and any references to psychological assessment were blacked out prior to this procedure. Neither psychologist had access to any MMPI-2 or Rorschach data, and the first psychologist was not familiar with the cases prior to assigning diagnosis.

For the purposes of this study, diagnosis was made within eight categories: (1) schizophrenia; (2) other psychotic, including schizophreniform disorder, psychosis not otherwise specified (NOS), and delusional disorder; (3) bipolar and schizoaffective disorder; (4) major affective disorder with psychotic features; (5) major affective disorder without psychotic features,

dysthymia, and depressive disorder NOS; (6) adjustment disorder; (7) personality disorder (cluster A, B, C, or NOS was specified); (8) addiction disorder *only* (i.e., this was coded if addiction was the essential diagnostic feature); and (9) organic disorder. Coding addiction disorders in this way was necessary as 48% of the sample had a history of either drug or alcohol abuse.

Diagnostic agreement was calculated in two ways. First, the Kappa statistic was calculated using two broad categories: individuals diagnosed with a schizophrenia spectrum disorder (schizophrenia, schizophreniform, psychosis NOS, or delusional disorder) versus those diagnosed with another disorder. This categorization reflected the diagnostic grouping for the present study. Kappa was .79, indicating substantial agreement. Second, percent agreement within the above nine categories was calculated at 65%. 31% of the disagreements involved a disagreement between schizophrenia and psychotic NOS, due to a lack of historical data in the hospital record (see discussion section). A third rater, also a clinical psychologist, was utilized to resolve disagreements.

As an additional analysis, clinical diagnosis was compared to discharge diagnosis. Discharge diagnosis,

assigned by the psychiatric resident, was based in part on the results of psychological assessment and therefore was not expected to agree fully with clinical diagnosis. Using the same two categories as above, Kappa was calculated based on the 65 individuals for whom hospital records were available. Kappa was .80, indicating substantial agreement. Second, percent agreement within the above nine categories was calculated. 58% of the diagnoses were assigned within the same categories. When categories one (schizophrenia) and 2 (other psychotic) were combined, agreement rose to 73%.

Potential Covariates

Relationship of R to other variables. The relationship of R (number of Rorschach responses) to MMPI-2 variables was examined via correlations (see correlation table for full results). R was significantly correlated with MMPI-2 scales F and 8 (r for both scales=0.20, $p<.05$), however, the proportion of variance accounted for was less than ten percent ($r^2=0.04$). R did not differ significantly between the two groups (mean (stdev) R low SCZI group= 19.7 (6.72), high SCZI group=20.6 (6.92); $t(83)=-0.62$, $p<.60$). As R accounted for less than ten percent of the variance and did not differ between groups, it was not used as a covariate in the main analysis (Exner, 1992; Tabachnick & Fidell, It should be noted that R was not significantly correlated with SCZI index variables X+, X-, or M-. As expected, it was significantly correlated with WSUM6 (cognitive slippage) ($r=.24$, $p<.01$) (Meyer, 1993).

Gender, race, occupation and substance use. Group differences in gender, race, occupation, and substance use were examined via five X^2 analyses. (The number of individuals in each group can be found in Table 8, p. 50). The proportion of males and females did not differ between SCZI group ($X^2=0.00$, $df=1$). Groups were

not different in racial composition (X^2=1.88, df=2) nor occupational status (X^2=3.00, df=5). Groups did not differ significantly in drug (X^2=0.07, df=1) or alcohol use (X^2=0.00, df=1).

Age and education. Two student's t-tests were employed to test for group differences in age and education. The two groups (elevated SCZI index vs. not) did not differ significantly in age or education level. Mean (standard deviation) age for the low SCZI group was 35.3 (11.28) and high SCZI group was 31.5 (10.76) (t(83)=1.54). Mean education for low SCZI group was 11.6 (2.61) and the elevated SCZI group was 12.4 (2.47) (t(82)=-1.33).

Power

Power to detect a "true" significant relationship in the main analyses was estimated using the procedure in Hays (1988). Power was determined by the number of groups, the number of subjects per group, alpha, and estimated effect size. There were two groups in the main analysis (elevation on the SCZI scale vs. not), with 30 individuals in the smaller group. Alpha rate was set at .01. Finally, a moderate effect size was estimated (main effect accounts for fifteen to twenty percent of variance). Profile analysis is similar to a repeated measures Analysis of Variance (ANOVA). Thus,

using the procedures in Hays (1988) for calculating power for ANOVA, thirty subjects per group yielded a power of between .80 and .98 (depending if true proportion of variance accounted for is .15 or .20, respectively).

Profile Analysis

In order to test the hypothesis that individuals with elevated and non-elevated SCZI indices have significantly different MMPI-2 profiles, a profile analysis was performed. A profile analysis is statistically similar to a repeated-measures analysis of variance, but useful when all of the dependent variables are measured on a similar scale (Tabachnick & Fidell, 1989). The main difference between profile analysis and repeated measures ANOVA lies in the treatment of the dependent variables. In profile analysis, the dependent variables are transformed into line "segments", and the segments, rather than the original dependent variables, are analyzed. These segments correspond to the difference between two adjacent scores on the profile. For instance, the difference in T-scores between MMPI-2 scales 1 and 2 constitute one segment. Like a repeated measures ANOVA, three tests are made. The first, "parallelism" test measures the degree to which the two profiles are

similar, and is commensurate with the group by repeated measures interaction in ANOVA. The second "overall" test indicated if there are any differences in group elevations overall (similar to the between-subjects effect in ANOVA). The final test examines the "flatness" of the profiles, that is, if any group deviates significantly from zero. This test is comparable to the repeated measures effect in ANOVA and is usually of little interest in profile analysis (Tabachnick & Fidell, 1989).

Assumptions for multivariate analysis. As the data was analyzed via a repeated-measures model, the dependent variables (MMPI-2 scales) were transformed into line segments. The MMPI-2 segments were examined for both univariate and multivariate outliers: none were found. Multivariate analysis requires four assumptions. The assumption of linearity, which requires the independent and dependent variables to be linearly related, was met: SCZI has only two levels and is therefore linearly related with other variables (Tabachnick & Fidell, 1989). The second assumption, multicollinearity, was also met: the segments were not correlated above 0.90. A third assumption for the model requires that the variances of all the transformed variables be equal and their covariances be

zero. This assumption was rejected (Mauchly's sphericity test, W=0.01, $X^2(df$=27)=352.6, p<0.01). As the sphericity assumption was violated, the degrees of freedom for the averaged F-test were corrected using the Greenhouse-Geisser epsilon (Kirk, 1982). The averaged F test was preferred to the multivariate F test (such as Wilks' F) since it is more sensitive to differences with relatively small samples, such as that utilized here. The Greenhouse-Geisser correction was chosen as it is the most conservative adjustment (i.e., minimizes Type I error; Norusis, 1993). The fourth and final assumption of the homogeneity of variance matrix was met (*Box's* M=38.8, p=.17).

Eight MMPI-2 scales (L,F,K,2,6,7,8,9) were included in the profile analysis, allowing at least ten subjects per variable. Where applicable, K-corrected scores were used. The total sample was divided based on elevations of the SCZI index (less than 4 vs. 4 or greater). The profiles of the two groups were not found to be significantly different (SCZI group X MMPI-2 profile interaction; averaged F (3,219)=2.55, p<.06, eta^2=0.03). The overall group effect was likewise not significant (F(1,83)=3.36, p<.08, eta^2=0.04). As expected, the MMPI-2 within subjects effect was also significant (Averaged F(3,219)=74.4, p<0.000).

Post-hoc contrasts were utilized to determine if any line segments were non-parallel. The entire MMPI-2 profile was included in this analysis so that the results would correspond to clinical MMPI-2 profiles, (i.e., line segments would correspond to scales 1-2, 2-3, etc.). The MMPI-2 profile X SCZI group interaction for this analysis remained non-significant (Wilks' $F(12,72)=1.72$, $p<.09$ $eta^2=0.22$), as did the overall SCZI group effect ($F(1,83)=2.79$, $p<0.10$, $eta^2=0.03$). Segments which differed significantly between groups are marked in Figure 1.

Exner (1991) and other sources (Archer & Gordon, 1988) have suggested that using a cutoff of five or higher (as opposed to four) on the SCZI index improves the predictive validity of the index. A second profile analysis examined differences between individuals who scored a five or higher on the SCZI index versus individuals who scored two or less. Thus, individuals who scored a three or four on the SCZI index were eliminated from the analysis. The resulting SCZI groups n's were significantly lowered (five or higher n=12, two or less n=44). To conserve power, only five MMPI-2 variables were included in the analysis, again allowing approximately ten subjects per variable. Specifically, the analysis included MMPI-2 scales F, 2,

6, 7, and 8. The SCZI index groups evidenced significantly different MMPI-2 profiles (Averaged $F(2,130)=4.75$, $p<0.01$, $eta^2=0.09$). The SCZI group effect was also significant ($F(1,53)=4.05$, $p<.05$, $eta^2=0.07$). Note that only 5 MMPI-2 scales were included in the analysis; however, for continuity, the entire profile is plotted in Figure 2.

Summary. No potential covariates (age, gender, drug and alcohol use, and record length (R)) were found. A profile analysis was performed including MMPI-2 scales L,F,K,2,6,7,8,9, as the dependent variables and SCZI group as the between subjects variables. No significant differences ($p<.01$) were found using a SCZI index cutoff of 4. However, when the analysis was repeated using a higher SCZI index cutoff (elevated group SCZI=5 or 6, non elevated group < 3), the profiles were found to be significantly different. In addition, the elevated SCZI group evidenced higher MMPI scale scores overall.

Figure 1

MMPI-2 Profiles for SCZI Index Groups

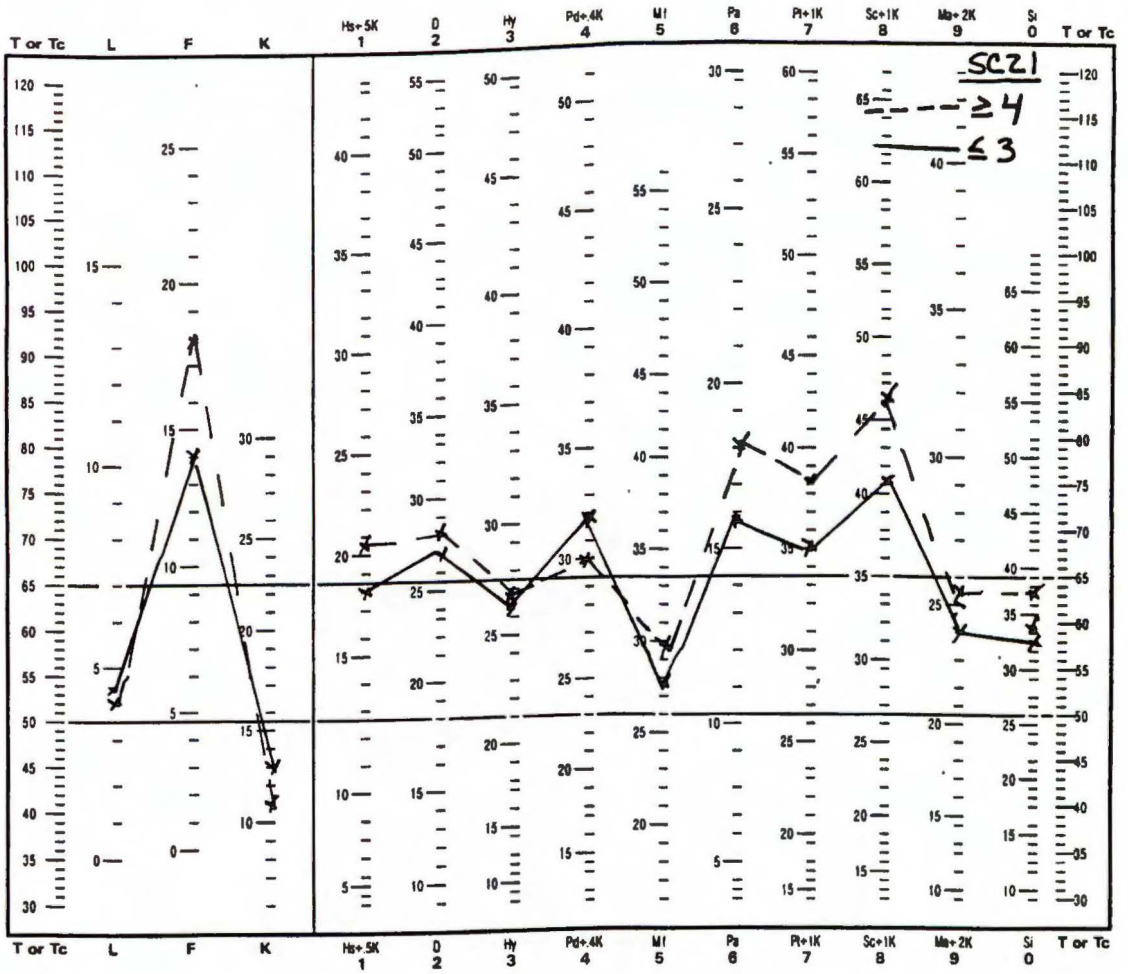
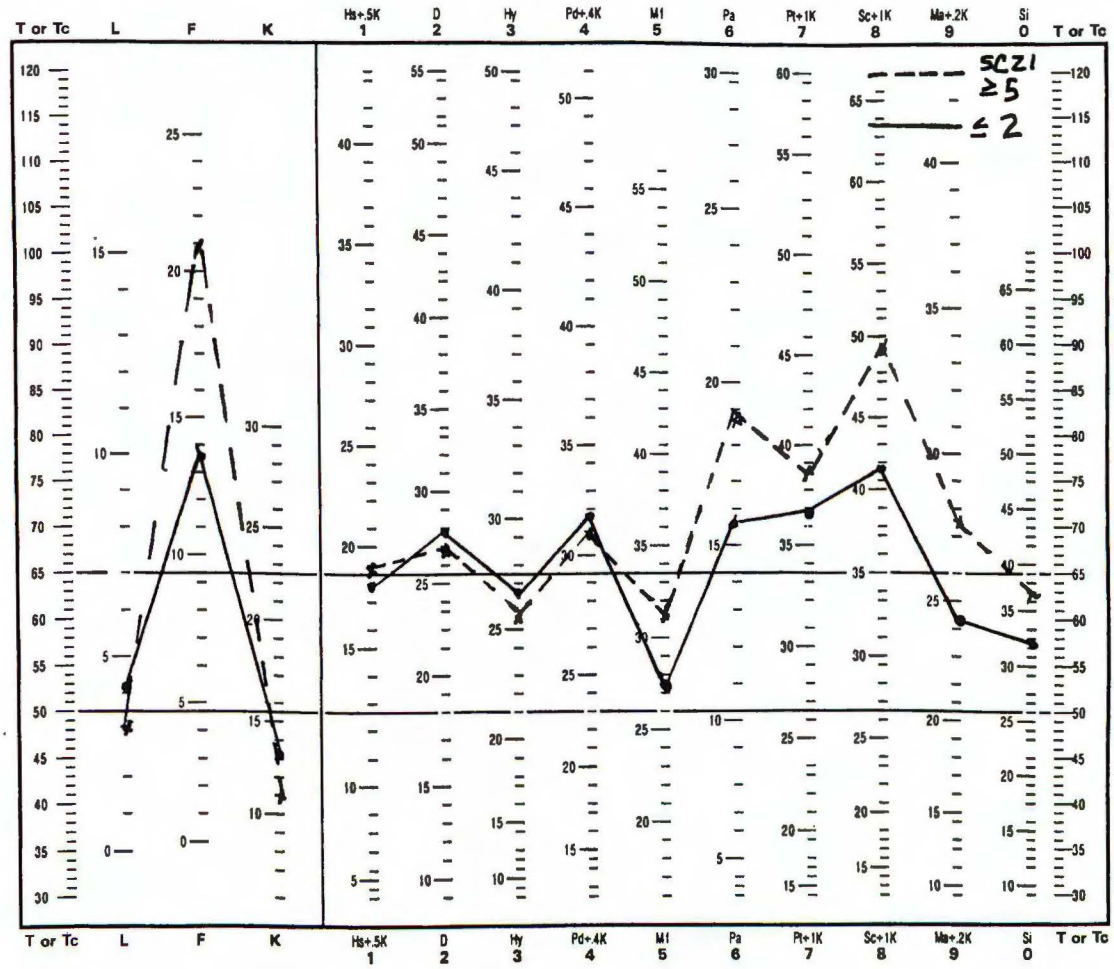


Figure 2

MMPI-2 Profiles for SCZI Groups (≥ 5)



Planned Hypotheses

Non-normally distributed Rorschach variables (M-, Fabcom, and H) were not included in the correlation table. Also, as described above, the following variables were transformed: Adjusted D (capacity for control), Lambda (involvement in task), R (number of responses), Weighted Sum 6 (cognitive slippage), and isolate/R (social isolation). Recall that isolate/R remained slightly skewed. Finally, an additional variable, color, was added. This variable was computed by the formula (FC+1)-(CF+C), and reflects the proportion of color responses which were primarily form dominated (FC) minus those that were primarily color-dominated (CF+C). Individuals who provide a higher number of pure color responses may have difficulty maintaining affective control; the color variable was created to test the hypothesis that manifestations of affective dyscontrol on the Rorschach would be associated with MMPI-2 scales 4 and 9 (see Hypotheses, Table 6). The color variable was normally distributed, although it evidenced a significant positive kurtosis (kurtosis=1.59, standard error of kurotsis=.51, .001> p <.01). Using the above guidelines, the significance of the kurtosis was just above the acceptable level (p<.001; Tabachnick & Fidell, 1989). Thus, it was

included in the analysis although caution should be exercised in interpreting results based on this variable.

The relationship of MMPI-2 and Rorschach variables were examined in two stages. The first analysis tested the planned correlations, as detailed in Hypotheses, Table 6 (above). Each of these will be described below.

Defensiveness. The first hypothesis was that individuals with an elevated Rorschach Lambda (disengagement from the task) and a low R (few number of responses) would have elevated MMPI-2 K (defensiveness) scales. This was examined in two ways: through correlations and a profile analysis. First, Lambda and R were correlated with the MMPI-2 variables L, F, and K. Of these, only the relationship of R with F was significant (r=0.20, p<0.05) (see Table 13 for all correlations).

Since the three MMPI-2 validity scales (L,F, and K) are used in tandem, as the MMPI-2 profile scales are, a validity scale profile analysis was performed. It was hypothesized that individuals with a high Lamda or low R would evidence a defensive validity scale pattern.

The pattern of validity scales for high R, as

compared to low R groups, was examined. Groups were divided at the median number of responses (median R=18), and a profile analysis was performed using L, F, and K as the dependent variables. Groups did not differ in profile pattern (Averaged $F(2,168)=2.57$, *ns*) or overall elevation ($F(1,84)=0.43$, *ns*) on these scales.

A similar analysis examined the pattern of validity scales for a low Lambda and high Lambda group. The group was divided on the median Lambda score (median Lambda=1.0). No significant group X profile interaction (Averaged $F(2,168)=0.03$, *ns*) or group effect ($F(1,84)=0.43$, *ns*) was found.

Affective Dysregulation. The second hypothesis stated that unbalanced Rorschach color ratios (CF + C > FC + 1) would be related to elevations on MMPI-2 scales 4 and 9. Unbalanced color ratios reflect an inability to control emotional expression. Affective dysregulation has been found to be prominent in schizophrenic groups (Exner, 1986). Scale 4 measures acting out in antisocial ways; scale 9 measures emotional energy. Using Pearson correlations, the color variable was not significantly related to MMPI scale 4 ($r=-.04$, *ns*), but was related to scale 9 ($r=-24$, $p<.01$).

Self-esteem. Third, it was hypothesized that low scores on the Rorschach egocentricity index (3r+2/R), indicating a poor sense of self, would be related to an elevated MMPI-2 Low Self Esteem Scale (LSE), indicating poor self esteem. The correlation between these two measures was significant (r=-.21, p<.05).

Interpersonal relationships/paranoia. Fourth, it was hypothesized that a higher number of M- scores would be related to an elevated scale 6 (paranoia). M-, a measure of distorted thought in interpersonal situations, is included in the SCZI index. Individuals with more than one M- score meet one requirement for the index. As M- was a nonparametric variable, M- was divided into two groups based on the criterion in the SCZI index (M- =< 1 and M- > 1). The elevations of scales 6 and 8 were examined via two student's t-tests. In order to conserve power, t-tests were not performed for the entire MMPI-2 profile. However, group differences in scale 2 were examined as a partial test of whether M- was related to greater psychopathology in general or to scales measuring psychotic symptoms. Scale 2 was chosen as M- was not expected to be related to scale 2 (depression). M- groups did not differ significantly in scale 2, 6, or 8 (Scale 2 t=0.51, *ns*; scale 6 t=-1.11, *ns*; scale 8 t=-

1.09, *ns*; see Table 12 for means and standard deviations). However, dividing the groups based on a M- of 2 produced very unequal groups; only 13 individuals gave more than one M- response.

Given the low frequency of M- responses, the above t-tests were repeated with the group divided at one M- response (greater than 0 M- responses vs. individuals with no M- responses). Using these groups, individuals with at least one M- response evidenced greater Scale 6 and 8 T-scores (Scale 6 t=-3.11, p<.01; scale 8 $t(83)$=-2.73, p<.01). No difference in scale 2 T-scores were found ($t(83)$=-0.96, *ns*). Table 12 presents means and standard deviations for each group.

Summary. Three of the four hypotheses were confirmed. The first hypotheses, that the Rorschach validity indices (R and Lambda) would be related to MMPI-2 validity scales, was not confirmed. Unbalanced color ratios (affective dysregulation) were associated with scale 9. A low egocentricity index (poor sense of self) was associated with an elevated Low Self-Esteem scale. Finally, individuals with at least one M- score (disordered thought in interpersonal relations) evidenced higher scale 6 (paranoia) and 8 (psychosis) T-scores.

Additional Correlations

A second, more general analysis related Rorschach variables to MMPI-2 scales and subscales. The results of this analysis is presented in Tables 13 and 14. These correlations were performed to explore the relationships between the two instruments and to provide directions for future research. As this large number of correlations were not based on a-priori hypotheses, caution should be used in interpreting the results.

Table 12

Mean Scale 2, 6 and 8 T-scores based on M- groups

Number of M- responses	*n*	Scale 6[a]	Scale 8	Scale 2
0 or 1	72	72.9 (19.30)[b]	78.9 (18.24)	69.8 (14.86)
2 or more	13	79.7 (25.92)	85.2 (23.70)	67.5 (15.47)
0	55	69.1 (18.58)	75.8 (18.20)	68.3 (15.47)
1 or more	30	82.8 (20.95)	87.2 (18.91)	71.6 (13.75)

[a] T-scores
[b] mean (standard deviation)

Table 13

Correlation of Selected MMPI-2 and Rorschach Variables

	Rorschach Variable									
MMPI-2	R	Lambda	X+%	X-%	Wgted Sum 6	Afr	Color[a]	Ego[b]	Adj D	Isol R
L	-.11	-.02	.16	-.04	.00	- .14	-.04	.07	-.04	-.21*
F .13	.20*	-.05	-.27**	.14	.31**	.05	.09	-.10	.01	
K	.02	-.06	.22*	-.24**	.01	- .13	-.24**	-.03	.11	-.15
1	.13	.01	-.13	.11	.18*	.13	.01	-.09	-.12	.15
2	.04	.05	-.13	.12	-.11	.05	.08	-.10	-.20*	.15
3	.05	-.03	-.06	.05	.06	.08	-.04	-.10	-.18	.09
4	.00	.09	.00	.01	-.10	.09	-.04	-.15	-.11	.11
5	-.03	-.11	-.28**	.22*	.23*	-.02	.19*	.05	.10	-.01
6	.05	-.05	-.21*	.20*	.21*	.04	.11	-.06	-.05	.07
7	.09	.04	-.13	.21*	.12	.07	.06	-.20*	-.21*	.17
8	.20*	-.04	-.18*	.22*	.24**	.10	.06	-.20*	-.08	.25**
9	.06	-.17*	-.12	.05	.26**	-.10	-.24**	-.12	.06	-.07
0	.10	.11	-.15	.24**	.01	.20*	.18*	-.08	-.21*	.28**

[a] (FC+1)-(CF+C) [b] egocentricity Index (3r+2/R) * $p<.05$ ** $p<.01$

Table 14

Correlation of MMPI-2 and Selected Rorschach Variables

	Rorschach Variable									
MMPI-2 Subscale	R	Lambda	X+%	X-%	Wgted Sum 6	Affect Ratio	Color[a]	Ego[b]	Adj D	Isol R
Low Self Esteem	.07	.11	-.12	.16	-.02	.06	.16	-.21	-.07	.15
Bizarre Mentation	.23	.07	-.20	.14	.16	.10	.15	-.14	.03	.08
SC1	.15	.01	-.20*	.14	.14	.09	.14	-.14	.08	.29**
SC2	.15	-.03	-.21*	.14	.07	.20*	.15	-.11	-.14	.24**
SC3	.01	.04	-.21*	.20*	.02	.01	.12	-.14	-.22*	.20*
SC4	.13	.03	-.16	.11	-.04	.09	.14	-.14	-.20*	.24**
SC5	.09	-.12	-.19*	.22*	.24*	.02	.10	-.06	.06	.29**
SC6	.18	-.21*	-.19*	.16	.34**	.01	.12	-.04	-.03	.24**
PA1	.07	.11	-.11	-.12	.04	.22*	.25	.03	-.06	.02
PA2	.14	-.09	-.22*	.15	.08	.12	.07	.04	-.05	.06
PA3	-.03	-.08	.11	-.13	.09	-.13	-.06	-.04	-.03	-.15

[a] (FC+1)-(CF+C) [b] Egocentricity Index (3r+2/R) * $p<.05$ ** $p<.01$

Diagnosis

Clinical diagnosis was available for 75 individuals. The ability of each instrument to predict a psychotic diagnosis (schizophrenia, schizophreniform, psychosis NOS, and delusional disorder) was examined. This broad categorization was utilized given (1) the low rate of schizophrenia diagnosis in the sample; and (2) the difficulty diagnosing schizophrenia from hospital records which often did not include information regarding duration of illness, a necessary criteria for schizophrenia (see Discussion, below). Sensitivity (true positives/true positives plus false negatives), specificity (true negatives/true negatives plus false positives), hit rate (true positives plus true negatives/total sample), and false positive rate were calculated based on a variety of criteria. These results are presented in Table 15. Rates were calculated for both the full sample and excluding schizoaffective and bipolar disorders. This was done to assess the possibility that these diagnoses, which may have strong psychotic features, may have skewed the results.

Table 15

Sensitivity, specificity, hit rate and false positive rate for MMPI-2 and Rorschach criteria[a]

Criteria	Sensitivity	Specificity	Hit Rate	False Positives
Rorschach only				
SCZI ≥ 4	.42	.71	.58	.21
SCZI ≥ 5	.23	.88	.60	.09
MMPI-2 Only				
Scale 8 ≥ 65	.71	.20	.42	.48
Scale 8 is the highest clinical scale	.35	.78	.35	.18
8 part of 2-point high code	.74	.40	.54	.39
Combination Rorschach & MMPI-2				
Either SCZI ≥ 4 or Scale 8 ≥ 65	.81	.16	.39	.55
Both SCZI ≥ 4 and 8 ≥ 65	.39	.78	.61	.17
Either SCZI ≥ 4 or Scale 8 part of 2-pt high code	.77	.30	.50	.49
Both SCZI ≥ 4 and Scale 8 part of 2-pt high code	.37	.85	.63	.12
Rates without Bipolar and Schizoaffective Disorder[a]				
Rorschach only				
SCZI ≥ 4	.46	.74	.60	.13
MMPI-2 Only				
Scale 8 ≥ 65	.77	.33	.51	.40
8 part of 2-point high code	.73	.44	.58	.28
Combination Rorschach & MMPI-2				
Either SCZI ≥ 4 or Scale 8 part of 2-pt high code	.81	.33	.57	.34
Both SCZI ≥ 4 and Scale 8 part of 2-pt high code	.42	.78	.60	.11

[a] n=75

CHAPTER 8

DISCUSSION

The study demonstrated a relationship between MMPI-2 and Rorschach variables related to psychosis. The MMPI-2 profile was found to be significantly different for groups based on the SCZI index elevation when a SCZI index cutoff of 5 was used. This result is in contrast with previous research, which has not found an association between the SCZI index and MMPI-2 variables. Relationships between both measures and a psychotic clinical diagnosis were found. Neither measure in isolation provided both an adequate sensitivity and specificity; the MMPI-2 demonstrated a better sensitivity while the SCZI index yielded better specificity. Simply stated, the MMPI is vulnerable to false positives and the Rorschach is susceptible to false negatives. The combination of the MMPI-2 and the Rorschach SCZI index resulted in a high specificity with very few false positives.

The following sections will address the following issues: (1) the results of the profile analysis; (2) sensitivity and specificity of the measures; (3) the planned hypotheses; (4) the correlation table; (5) normative data; and (6) interrater reliability.

Profile Analysis: Current Results

The average K-corrected MMPI-2 profile for the entire sample was nondistinct: scales 2,4,6,7,8, and 0 were all above a T-score of 65, with no significant difference between them. This was also the profile for the non-elevated SCZI index group. The profile suggests a general "mixed bag" of diagnoses (Graham, 1993). In contrast, the elevated SCZI group produced a 8-6-7 profile. The most common diagnosis for this profile is schizophrenia (Graham, 1993; Walters, 1988; Wetzler and Marlowe, 1993). In addition, the SCZI group effect approached significance, suggesting a trend for the elevated SCZI group to endorse more pathological symptoms in general, and thus elevate on many MMPI-2 scales.

The 8-6-7 profile became more marked (reaching significance) when the cut-off for the SCZI index was increased from four to five: T-score increases of four or more points were noted on scales F, 2, 6, 8, and 9, while scale 7 did not change at all. As scales 6 and 8 increased, while scale 7 did not change, the difference between scales 6/8 and scale 7 increased. More simply, the T-score difference between scales 7 and 8 was 7.8 using a SCZI cutoff of four, and 14 points using a cutoff of five or greater. This is important factor

in MMPI-2 interpretation. As scale 8 becomes greater than scale 7 by 10 T-score points, the likelihood of a thought disorder, particularly a chronic one, increases (Graham, 1994; Walters, 1988). In contrast, when scales 7 and 8 are equal, or scale 7 is greater than scale 8, the likelihood of an *acute* disorder and symptoms of confusion, but not delusions, are more likely (Graham, 1994). Increasing the SCZI cut-off in this way may have eliminated individuals with more nebulous diagnoses and enhanced the SCZI-MMPI-2 relationship. In effect, increasing the SCZI cut-off from four to five resulted in a group of individuals who evidence more symptoms of a long-standing thought disorder on the MMPI-2.

An alternative interpretation of these results might be that using the higher cutoff simply created a group with more severe pathology, who endorsed a greater number of MMPI-2 items across the board. This hypothesis follows from the significant group effect, with the elevated SCZI group producing higher MMPI-2 scale elevations overall. When the profile means for all MMPI-2 scales are examined closely, it is seen that the SCZI group did not elevate on every MMPI-2 scale. In fact, it appears that the elevated SCZI group was equal to or *less* than (less than 5 T-score point

difference) the non-elevated group on the MMPI-2 scales 1,2,3,4 and 5 (although no statistical test was performed to evaluate the significance of this difference). In contrast, this group had mean scores on scales 6, 7, 8, and 9 which were at least 5 T-score points greater than the non-elevated group; this difference increased to at least 10 points when the SCZI cutoff was increased. Scales 1, 2, 3 and 4 can be considered indicators of "neurotic" as opposed to "psychotic" tendencies (Goldberg, 1972; Meehl & Dahlstrom, 1960). The SCZI group effect seems to have been influenced by the "psychotic" scales: 6, 8, and 9. This hypothesis corresponds with previous research. Utilizing a discriminant function analysis, Libb and colleagues (1992) found that scales L and 8 were positively associated a diagnosis of schizophrenia, while scales 2 and 3 were negatively associated with this diagnosis.

It seems likely that a combination of these interpretations would fit. Increasing the cutoff from four to five produced a group with more severe pathology in general, with a greater tendency to endorse items related to a chronic thought disorder.

Profile Analysis: Integration with previous research

In contrast to the current results, previous

research has not found an association between the SCZI index and MMPI variables. Archer and Gordon (1988) found low correlations between the MMPI scale 8 and the SCZI index in diagnosing schizophrenia in adolescents (r=.11, p<.05). These authors suggest that the SCZI index may be less effective for adolescents. Meyer (1992) examined adults, but did not find a relationship between Scale 8 and the SCZI index (r=-.02).

Methodological reasons may partly account for the disparate results between Meyer's study and the current study. It may be that the current sample included a greater number of individuals with a diagnosis of schizophrenia, producing a greater range of SCZI index scores. This is unlikely as Meyer reports 39 individuals with a psychotic disorder in his sample (current study n=31). It is also unlikely that one or several outliers in the current sample carried this relationship, as no univariate and multivariate outliers were found.

Three methodological reasons which may account for the different results are (1) the selection of samples; (2) treatment of the SCZI index; and (3) use of the MMPI-2 profile. Each will be examined below.

The sample selection differed in the two studies. The current sample is an inner city, inpatient sample.

All individuals who completed both the Rorschach and MMPI-2 were included (albeit with some exclusion criteria, i.e., reading ability). In contrast, Meyer's sample consisted of both inpatients and outpatients selected on the basis of *how many Rorschach responses they provided*, (divided into three groups of respondents-low, average, and high R). This expanded range of responses (R) provided a better opportunity to examine the relationship between R and Rorschach variables. However, the subjects selected may not have been representative of inpatients. For instance, Meyer found that the SCZI index score was equally elevated (mean greater than three) for individuals with and without a psychotic diagnosis when the protocol was long. Thus, if an individual gave 50 responses to the Rorschach, he is more likely to elevate *falsely* on the SCZI index. This is because several criteria (M-responses and Special score criteria) are scored based on the sum of the occurrence of these responses in the record. As record length increases, they are more likely to occur, and the index is more likely to be positive. Indeed, Meyer (1993) found a relationship between record length and special scores and M-criteria; an association between record length and special scores was found presently (r=.19). However,

records of great length are statistically infrequent. Using inpatient norms, records of greater than thirty responses (Meyer's high-R group) occur less than sixteen percent of the time; for the adult normative sample, they occur less than two percent of the time (Exner, 1991). In Meyer's study, lengthy records (30 or more responses) composed 33% of the sample; in the current study lengthy records composed 9% of the sample. While record length is pertinent information in the interpretation of these protocols, including them in an examination of the SCZI index and the MMPI-2 may have biased the relationship toward the null.

The examination of the data was different in the two studies. Meyer examined the correlation of the SCZI *as a whole* with one MMPI-2 scale, scale 8, as did Archer and Gordon (1988). Currently, parametric components of the SCZI index, as well as other Rorschach variables considered relevant to psychosis, were correlated with MMPI-2 clinical and validity scales. In fact, when the SCZI index as a whole was correlated with scale 8, it was nonsignificant (Spearman's r=.13), although similar to the value reported by Archer and Gordon (r=.11). In Meyer's data, components of SCZI may have been related to the MMPI-2 but were not uncovered by examination of the

index as a whole. These relationships add to the understanding of both scales. For instance, the relationship of X+% to Scale 8 was nonsignificant currently (r=-.13), while X-% was significantly related to Scale 8 (r=.22). This finding suggests that high Scale 8 scores are associated with psychotic processing, not simply unconventional thought processing. (These relationships will be discussed in detail under Correlations, below). Understanding these relationships provides additional meaning in the interpretation of both measures.

Finally, the current study compared the SCZI (as a dichotomous variable) to the entire MMPI-2 profile. Previous research has not examined the relationship of SCZI to the MMPI-2 profile (Archer and Gordon, 1988; Frueh, Leverett, and Kinder, 1995; Meyer, 1993). As Meyer did not report information on other MMPI-2 scale scores, it is unclear if he would have found a profile difference. Many researchers have theorized that much of the utility of the MMPI-2 stems from using the entire profile, rather than several scales in isolation (e.g., Libb, Murray, Thurstin, and Alarcon, 1992; Moldin, Gottesman, Rice, & Erlenmeyer-Kimling, 1991). The use of a profile (as opposed to a single scale) has been shown to improve the predictive validity of the

MMPI-2 (Walters, 1988). In fact, the scale 8 T-scores were clinically elevated in both SCZI groups (elevated SCZI=84.2 and non-elevated SCZI=77.4). While these means may have been significantly different, examination of a single scale neglects the information available in the other scales. The scale 8 difference also provides clinicians with little diagnostic information when confronted with an individual profile. The use of the MMPI-2 profile in research has direct correspondence to clinical practice.

In sum, it is likely that the selection of samples combined with the use of the entire MMPI-2 profile account for the discrepancy of the current study results from Meyer's results.

Diagnosis

Sensitivity, specificity, and hit rate for a variety of criteria are reported in Table 15.

SCZI Index. The sensitivity and specificity of the SCZI index was comparable to what has been reported previously. Archer and Gordon (1988) found the SCZI to have a sensitivity of .47 and specificity of .73 in assessing adolescents. Exner (1991) reports a slightly higher SCZI specificity of .78 to .86 in diagnosing adults, with a false positive rate of 11%. Higher false positive rates have been found for other

diagnostic groups (e.g., 13% for borderline personality disorders, 37% for schizotypal personality disorder; Exner, 1986). The false positive rate in the current study was higher, at 21.0%.

One possible explanation for the current high false positive rate is record length. Exner (1991) notes that as R increases, the potential for a falsely elevated SCZI also increases. Meyer (1993) found that the mean SCZI for high-R records was 3.4. In order to investigate the possibility that long records resulted in false positives, the mean number of responses for individuals with an elevated SCZI who did not receive a psychotic diagnosis was examined. The mean R for this group was 21.0, only slightly higher than the full sample mean R of 20.3.

A second possibility for the high false positive rate is that the SCZI index is highly sensitive to any psychotic symptoms, regardless of psychiatric diagnosis. When a SCZI index cut-off of five was used, the false positive rate fell to 9%. The hospital records of these seven individuals were reviewed to understand the false positive rate. Two individuals were diagnosed with schizoaffective disorder, a third with bipolar illness. Two additional individuals had documented evidence of psychotic symptoms, and received

a diagnosis of depression with psychotic symptoms. Another individual was diagnosed with adjustment disorder (he was hospitalized after a death in the family), but had a previous history of mania. The final "false positive" received a diagnosis of depression, and no evidence of psychosis could be found in his records, although his record was extraordinarily long (R=50).

In sum, the false positive rate on the SCZI index is likely due to its sensitivity to psychotic symptomatology, rather than record length. Although one individual did elevate due to a lengthy record (R=50), the average number of responses for false positive records was similar to that in the full sample.

MMPI-2. The "false positives" issue is more pertinent for the MMPI scale 8. Wetzler and Marlowe (1993) found that scale 8 was equally elevated in their psychotic and non-psychotic groups. Archer and Gordon, in diagnosing adolescents, found a specificity of only .42, indicating a high false positive rate. In the current sample, the specificity of scale 8 T-score greater than 65 was extremely low (.27), with a false positive rate of about 48%.

One hypothesis is that the relatively high rate

of individuals abusing alcohol or drugs (48% of the sample) resulted in a relatively high false positive rate. Graham (1991) notes that scale 8 is sensitive to bizarre experiences secondary to drug abuse. This issue was examined in the current data. Of individuals with an elevated scale 8 who were not given a psychotic diagnosis, 45% had a known history of drug or alcohol abuse, a number similar to that in the full sample (48%). However, of those individuals with an 8-6/6-8 profile who were not given a psychotic diagnosis, 67% had a history of substance abuse. This number is slightly larger than the full sample, and may partially explain the high false positive rate. However, it is unlikely that this issue fully explains the false positive rate.

A second possibility for the high false positive rate for Scale 8 may be the acute disorganization many inpatients experience. Walters (1983) notes that scales F, 2 and 8 are sensitive to transient states of situational distress and confusion, and therefore more likely to be elevated in inpatient units, regardless of the diagnosis. Elevated scale 8 T-scores have been found for a wide variety of populations (e.g., post-traumatic stress disorder, affective disorders, substance abuse; Frueh, Leverett, and Kinder, 1995;

Libb, Murray, Thurstin, and Alarcon, 1992). Walters suggests that the relative elevation of scale 8 with other scales should be examined. This procedure is supported by a recent study which found affective, schizophrenic, and substance abuse groups evidencing similar scale 8 T-scores, although the profiles were significantly different (Libb, Murray, Thurstin and Alarcon, 1992). In fact, using the criterion "scale 8 is the highest clinical scale" (as opposed to simply elevated), specificity rose to .71, with a false positive rate of 18%.

In sum, the high false positive rate for scale 8 is likely due to two factors. First, the relatively high incidence of drug abuse among high scale 8 scorers who were not psychotic may have contributed to the rate. Second, it is likely that scale 8 is sensitive to acute disorganization. This second reason supports the use of diagnostic profiles, rather than single scale elevations, in diagnosing schizophrenia.

Other researchers have suggested that profiles and code-types bear a stronger relationship to diagnosis of schizophrenia than single-scale elevations (Graham, 1991; Walters 1983; Wetzler and Marlowe 1993). In the current study, when scale 8 was part of a 2-point high code, sensitivity was .73, although the false positive

rate remained elevated (39%). Specific code types within diagnostic category were examined. Of individuals with a psychotic diagnosis, 36% had the 6-8/8-6 code type, while only 17% of non-psychotic individuals had this code type. Dahlstrom and Prange (1960) found this code type to be the most common among individuals with schizophrenia (see also Walters, 1983).

Combining the Rorschach and MMPI-2. The best "hit rate" (.63) occurred when the Rorschach and MMPI-2 criteria were combined (SCZI=>4 and 2-point scale 8 code type), resulting in a specificity of .82 and a sensitivity of .42 (false positive rate=12%). Archer and Gordon (1988) reported a similar combination; a scale 8 T-score greater than 75 and SCZI index greater than or equal to 4 produced a hit rate of .60 in diagnosing adolescents. These authors suggest combining the two instruments with clinical information in order to obtain diagnosis.

There are several important reasons for combining the instruments in the assessment of schizophrenia. Currently, the combination of the instruments produced a high specificity while maintaining sensitivity. As can be seen in Table 15 (p. 93), however, other criteria produce similar hit rates, most notably the

Rorschach SCZI index. Given the current findings regarding the sensitivity of the index to scorer error (see below, p. 128), only well-trained clinicians may feel comfortable relying on the Rorschach alone. More importantly, clinicians should administer several measures to gain a thorough understanding of the clients. The Rorschach and MMPI-2 yield complimentary information. Weiner (1993) notes that the measures "tap different levels of conscious awareness" (p. 150). Integrating seeming contradictions can generate rich descriptions of personality functioning (Weiner, 1993). Archer and Krishnamurthy (1993) speculate that patients who produce normal MMPI-2 profiles but dysfunctional Rorschachs may be able to remain comfortable in highly structured situations, but are vulnerable to disorganization in unstructured situations. Conversely, they theorize that elevated MMPI scale combined with a normal Rorschach may reflect individuals who wish to ensure that others will respond to their concerns. Lovitt (1993) demonstrated the utility of this approach clinically. He describes a case in which the integration of a "normal" MMPI-2 and "dysfunctional" Rorschach produced rich psychological information. Finally, it is responsible practice for clinicians to base their diagnostic conclusions on the

instruments combined with historical information. Exner (1991), Graham (1993), and Weiner (1993) encourage the use of other sources of information in diagnosing schizophrenia.

Planned Hypotheses

Three of the four planned correlations were found to be significant: the egocentricity index was negatively correlated with the Low Self Esteem scale, the color variable was related to scale 9 (but not 4), and M- was associated with an elevated scale 8. The hypothesized relationship between the Rorschach and MMPI-2 validity indicators was not confirmed. Each hypotheses will be discussed below.

Self-Esteem. It was hypothesized that low scores on the Rorschach egocentricity index (3r+2/R) would be related to high scores on the MMPI-2 Low Self Esteem Scale (LSE). The two were significantly correlated (in the expected direction, r=-.21 p<.01). The egocentricity index on the Rorschach purports to assess degree of self-involvement. Elevated scores reflect a tendency for narcissism, while depressed scores may signal low self-esteem (Exner, 1986b; Greenwald, 1990). The egocentricity index was significantly correlated with the low self-esteem content scale (LSE) on the

MMPI-2, indicating the individuals who endorsed items of low self-esteem had a depressed egocentricity index.

Despite reaching significance, the magnitude of the correlations were relatively small, sharing only approximately 5% of the variance. These conclusions should not be overgeneralized. However, as stated above, it is not expected that the Rorschach and MMPI-2 will produce parallel results; if fact, this is what makes their conjoint use important. None-the-less, research demonstrating relationships in the expected direction is important in validating both instruments.

The correlation of the egocentricity index with other MMPI-2 variables was also examined. These were not planned comparisons and therefore should be evaluated tentatively. It is not surprising that the egocentricity index did not correlate with MMPI-2 scale 2 (depression). Although this association has been found in adolescents (Caputo-Sacco & Lewis, 1991), the results have been equivocal (Duricko, Norcross, & Buskirk, 1989) and have not been replicated in adults (Barley, Dorr & Reid, 1985; Brems & Johnson, 1990). These previous studies have not found a relationship between the egocentricity index and any MMPI scale (Barley, Dorr & Reid, 1985; Brems & Johnson, 1990).

However, Brems and colleagues found a relationship between the egocentricity index and X-% (poor self esteem associated with psychotic thought processing); Barley, Dorr, & Reid found a relationship between the index and X+% (good self esteem associated with conventional thought processing). Currently, the egocentricity index was significantly correlated with two clinical scales, scales 7 and 8, suggesting individuals who exhibit low self-focus are more likely to endorse items relating to anxiety and psychosis. The combination of results suggest that individuals with a greater self-focus may be exhibiting more favorable psychological characteristics, including more accurate perceptions (Barely, Dorr & Reid, 1985). This insight and understanding may make them more amenable to treatment, an idea supported by the negative correlation of the index with negative treatment indicators scale on the MMPI-2 in the present study (high degree of self-focus associated with better treatment indicators, r=- .18).

Affective Dysregulation. It was hypothesized that unbalanced color ratios on the Rorschach (indicative of difficulty controlling affect) would be associated with elevated MMPI-2 scales 4 (antisocial acts) and 9 (mania). The hypothesis that the color variable would

be related to Scale 4 was not confirmed presently. While scale 4 would be expected to measure impulsivity, it may not be a direct measure of affective dyscontrol. Rather, scale 4 taps antisocial acts, including drug and alcohol abuse (Graham, 1993). The high incidence of substance use in the current group may have obscured any relationship with scale 4. In fact, Scale 4 was not significantly associated with any Rorschach variable examined.

The color variable was negatively correlated with Scale 9 (r=-.24; individuals with poor affective modulation on the Rorschach endorsed symptoms of affective dyscontrol and mania on the MMPI-2). Exner (1986a) found that inpatients with schizophrenia exhibited a greater degree of dyscontrol as measured by the color ratio. Along these same lines, the affective ratio was positively correlated with the Anger content scale (ANG). A high affective ratio suggests an attraction to emotional stimuli; high scorers on the Anger subscale typically feel and express a great deal of anger.

Paranoia. It was hypothesized that individuals who gave a greater number of M- responses (poor human movement; disordered thought) would have higher scores on MMPI-2 scale 6 (Paranoia). As M- is a nonparametric

variable, individuals were divided into two groups based on the number of M- responses, and their scores on MMPI-2 scales 6, 8 and 2 were examined via t-tests. One SCZI index criterion is positive if an individual gives more than 1 M- responses; this cut-off was used divide the sample in two groups. Poor human movement responses (M-) was not associated with Scale 2, 6 or 8 when the SCZI criterion (greater than 1 M- response) was used. However, when the criteria was changed to zero vs. one or more M- responses, individuals with M- responses were found to have significantly higher Scale 6 and 8, but not 2, scores. Dividing the group in this way was necessary given the low frequency of M- scores (this issue is discussed in Normative Data, p. 123).

M- responses are theorized to reflect disordered interpersonal perceptions, although research on M- has been scarce. Kunce and Tamkin (1981) found a relationship between M and scale 7 and 8 on the original MMPI. Archer and Gordon (1988) found a greater frequency of M- in adolescent schizophrenics and depressives. Despite the difficulty in analyzing it, M- may yield useful information in diagnosing schizophrenia. Perry, Viglione, and Braff (1992) developed the Ego Impairment Index to diagnose schizophrenia. M responses play a stronger role on

this index than on the SCZI index, as these scores contribute to two of the five criteria; aggressive movement responses contribute to a third criteria. The index was significantly related to MMPI scales 6, 8 and 9, and effectively discriminated paranoid and nonparanoid schizophrenics, although these authors did not specifically investigate the relationship between M- and MMPI-2 scales.

Defensiveness (R, Lambda, and MMPI-2 scales L, F, and K). R, Lambda, and the MMPI-2 validity scales L, F, and K reflect the willingness of the examinee to participate fully in the assessment and respond in an honest, open manner. As such, they are indicators of an invalid assessment (Exner, 1991; Graham, 1993, Meyer, 1992). It was currently hypothesized that low R (low number of responses) and/or high Lambda (disengagement from the task) records would be associated with an elevated K-scale (defensive responding) on the MMPI-2. This hypothesis was not confirmed either by correlation or a separate profile analysis. Of three MMPI-2 validity scales, only F was associated with R (r^2=.20). Lambda was not significantly associated with any MMPI-2 validity scale. In contrast, Meyer (1992) found R to be negatively related to K (high R associated with a less

defensive response style), but did not find a relationship between R and F. Exner (1978) found similar results, although he utilized an experimental design (i.e., subjects were instructed to give as many responses as possible).

There may be several reasons why R was not associated with K in the current study, as it has been in previous research (Exner, 1978; Meyer, 1993). It may be that methodological reasons accounted for the relationship. The MMPI-2 validity indicators are examined as a profile, rather than as single scale elevations. Similarly, R and Lambda are often examined simultaneously to understand the validity of the record. These possibilities will be examined below.

One explanation for the discrepancy in results may be that correlations examine MMPI-2 scales in isolation, not in tandem as one would do clinically. Examination of the validity scale profile is required to assess the reliability of the record. In order to examine the validity scale profiles, the group was divided into low and high groups for both R and Lambda and the profile of validity scales was examined for these subgroups. The validity scale profiles did not differ significantly for groups based on Lambda or R. However, the low R group had a slightly *lower* F scores,

and similar K and L scores. This finding corresponds to the positive correlation of R with F (reported above).

Along the same lines, clinicians examine R and Lambda together with other factors (i.e., behavioral observations) to assess the validity of the Rorschach record. Exner (1991) notes that "there is no easy way to distinguish [the record] that illustrates resistance from [the record] that reflects a valid indicator of coping style" (p. 125). He presents a number of strategies for interpreting high Lambda records (disengagement from the task). One strategy is to examine R and Lambda in tandem: a high R and low lambda may signal an invalid record (Exner, 1991). In the current study, there was no clear association between R and Lambda (r=.06), suggesting that low R was not consistently related to a high Lambda. Reasons for either a low R or high Lambda in the current study may include factors other than validity.

The overall lack of relationship between the MMPI-2 validity scales and Lambda and R may be due to these alternative factors. The validity scales of both measures can be interpreted in varying ways. For instance, an elevated F scale may reflect psychopathology, malingering, or resistance to

assessment (Graham, 1993). On the Rorschach, low R, and/or high Lambda could reflect a defensive process of simplification that the subject uses to cope with complex material (Exner, 1991). For instance, Lambda was negatively correlated with scale 9 on the MMPI-2. That is, low Lambda, which reflects a high level of emotional involvement with stimuli, is associated with high scale 9 scores, which reflect increased energy level and emotional lability (Exner, 1991; Graham, 1993). Conversely, a high Lambda, suggesting emotional constriction, is associated with a low 9 scale score, suggesting low psychological energy). Perhaps high Lambda in the current study reflects a general tendency for defensive emotional constriction rather than unwillingness to participate in the assessment. Along these same lines, R was associated with the affective ratio (r=.23). The affective ratio reflects the proportion of responses to the chromatic, as opposed to the achromatic, blots. A high affective ratio suggests an attraction for emotional stimulation. The positive correlation with R suggests that individuals with a greater attraction for stimulation became more involved in blot and gave a greater number of responses.

R (number of responses) and Scale F. Although R was not associated with K, as hypothesized, it was

correlated with another validity indicator, scale F (r^2=.20, p<.05). As this was not a planned correlation, the relationship should be interpreted with caution. In addition, despite the significance of the above correlation, the percent variance accounted for was quite small: the measures share 5% of the variance. None-the-less, it will be discussed here to suggest a tentative hypothesis regarding the validity scale relationships.

Scale F is a validity scale composed of rarely endorsed, bizarre items. Meyer (1993), in interpreting the R-K relationship, suggests that validity indicators measure one's willingness to reveal symptoms. In the current study, R was significantly related to F, as well as Scale 8, and Bizarre Mentation (BIZ) on the MMPI-2, all scores associated with psychotic symptoms. If R reflects willingness to reveal symptomatology, as Meyer suggests, then it is understandable that R is related to the endorsement of psychotic (or bizarre) symptoms on the MMPI-2. In this way, additional support is lent to Meyer's hypothesis.

R may represent the ability to filter inappropriate responses on the Rorschach. In psychiatric samples, long records may indicate difficulty censoring bizarre responses. Examination of

results within the Rorschach record provides some tentative support for this hypothesis. Meyer found R to be related to X+% (conventional thought processing), special scores (cognitive slippage), and M- (disordered thought) responses (utilizing a X^2 statistic). Currently, R was associated with special scores, but not X+, X-, or M- responses (although the nonparametric nature of the latter variable coupled with its lower than expected frequency makes this difficult to analyze). Meyer found R to be related to X+% (conventional thought processing), but not X-% (poor thought processing). In the current study, R was found to be skewed and was transformed prior to analyzing the data. It is noteworthy that there was a trend for the untransformed R to be associated with X+%, (r=-0.16, p<.08), but not X- (r=.05, *ns*), a result which replicates Meyer's findings. However, when R was transformed, this relationship was not found. Perhaps the skewed nature of R in the current sample masked the R-X+% relationship. As mentioned above, Meyer selected samples based on record length, thus it is likely that R in his sample was normally distributed. However, Meyer did not report information regarding distributions of his variables, making it difficult to compare samples.

Summary. The above results suggest that R (record length) needs to be interpreted with caution. R may reflect difficulty in censoring inappropriate responses, and thus is related to MMPI-2 scales and Rorschach variables sensitive to psychotic processing. The overall lack of relationships between validity scales, however, leads to questions regarding the interpretation of validity on both measures. It is possible that the difference in the nature of the two tasks require defensiveness to be manifested in different ways. Meyer (1993) notes that the MMPI-2 requires self-awareness and conscious responding, while the Rorschach is not directly mediated by conscious thought. Understanding the relationship of R is to the validity of the record, and the ways in which the relationship changes for different variables, is an important area for future research.

Correlation Table

Components of the Rorschach SCZI index were correlated with MMPI-2 scales. Due to the large number of correlations included in the table, coupled with the generally low proportion of variance accounted for, caution should be exercised in interpreting the results.

In general, results confirmed the profile

analysis. X+% and X-% were correlated in the expected direction with MMPI-2 scales F, K, 5, 6 and 8. With the exception of 5 and K, these scales are associated with psychotic symptoms and thought processing. X-% was also related to Scales 7 and 0. Scale 0 measures social isolation, and the relationship indicates that individuals with poorer processing tend to be socially isolated. This result is not surprising given the DSM-IV's inclusion of social dysfunction as a criteria for schizophrenia. Scale 5 is more difficult to interpret as an elevated scale 5 reflects different characteristics for men and women. Generally, an elevated scale 5 represents rejection of traditional gender roles. Individuals endorsing items reflecting nonstereotypical interests had lower X+% scores, indicating unconventional thought processing. Perhaps the relationship of scale 5 with X+ and X- reflects an idiosyncratic approach to traditional roles.

Correlations with Subscales

The correlations between the SCZI index components with MMPI-2 subscales were also examined (see Table 14). These relationships were used to assess the relationship between the SCZI index and the MMPI-2 scales. Again, these were not planned comparisons and a large number of correlations were calculated.

The SCZI index is composed of five key variables: X+ (conventional thought processing), X- (distorted thought processing), WSUM6 (cognitive slippage), Fabcom-level 2 (implausible combinations of objects), and M- (distorted thought processing in human movement). However, M- and Fabcom-level 2 were nonparametric, and therefore not included in the correlation table. Scale 8 on the MMPI-2 is composed of six subscales, labelled: Sc1 (social alienation), Sc2 (emotional alienation), Sc3 (lack of ego mastery, cognitive), Sc4 (lack of ego mastery, emotional), Sc5 (lack of ego mastery, defective inhibition), and Sc6 (bizarre sensory experiences).

X+% (conventional thought processing) was significantly correlated with all of the scale 8 Subscales (Sc1-Sc6). X-% (psychotic thought processing), in contrast, was significantly correlated with two scale 8 subscales: lack of ego mastery, cognitive (Sc3) and defective inhibition (Sc5). One hypothesis is that scales 3 and 5 distinguish psychotic processing (or a high X-%) from a lack of conventional processing (as reflected in a low X+%). Any hypothesis made about any of these scales must be very tentative as the magnitude of the correlations for all the subscales were similar, despite the fact that some

reached significance. Overall, these correlations provided little discrimination between subscales.

The pattern of correlations for WSUM6 (cognitive slippage) was particularly interesting. WSUM6 was positively correlated with both Sc5 (defective inhibition) and Sc6 (bizarre sensory experiences), while its relationship with other subscales was minimal. Walters (1983) notes that MMPI subscales 5 and 6, along with Sc3, may tap positive symptoms of schizophrenia, while scales Sc1, Sc2, and Sc4 may measure negative symptoms. WSum6, or bizarre verbalizations, can be considered a positive symptom of schizophrenia (e.g., Crow, 1990). Lambda and subscale 6 were similarly related: individuals exhibiting low Lambda scores (excessive involvement in task) scored higher on the bizarre sensory experiences scale. These associations lend support to the theory that subscales 3, 5, and 6 tap positive symptoms of schizophrenia.

Normative Data

The Rorschach variables in the present study approximated the values reported by Exner for inpatient schizophrenics (see Table 10, p. 64) Examination of the current data revealed seven variables in which the standard deviation was greater than the mean (Adj. D, D, WSUM6, Zd, Fab2, M-, and S). Three of these (Fab2,

M-, and S) are nonparametric; two additional variables (D and Zd) were not included in any analyses. The remaining two variables (WSUM6 and Adj.D) were transformed via a square root function prior to analysis, resulting in a normal distribution. The resulting mean (st.dev.) of WSUM6 was 3.5 (1.97) and Adj. D. was 1.8 (2.77).

The current normative values were compared to Exner's. Three current values differed by greater than 0.5 standard deviation from Exner's norms: WSUM6, Fab-level 2, and M-. Each difference will be addressed below.

WSUM6 and Fabcom (Cognitive Slippage). Fabcom-level 2 is a Rorschach special score reflecting an implausible combination between two objects. A level 2 is assigned when the combination reflects a severe disruption in thinking (i.e., "two women attacking a submarine", Exner, 1991). It is one of the six special scores which comprise the WSUM6 (Weighted Sum of Special Scores). Thus, these two variables will be addressed together.

The present value for weighted sum 6 (WSUM6) is 14.7, compared to a mean of 44.7 reported by Exner (1991). The average number of Fabcom responses was 0.3 currently, compared to 1.83 in Exner's sample. Both

of these variables evidenced nonnormal distributions currently; Fabcom was considered nonparametric and WSUM6 was transformed. Statistically, this makes it difficult to assess group differences in means. An examination of the median and mode for these variables, however, maintained the difference with Exner's norms. The median WSUM6 currently was 8, compared to 32 in Exner's sample. The median Fabcom-level 2 was 0 currently, compared to 1 in Exner's sample.

These differences are most likely due to differences in the two samples. Exner's sample is comprised only of schizophrenics, who are expected to elevate on Fabcom and WSUM6, while the present study included a mixed group of diagnoses. In comparison, Exner (1991) reports inpatient depressives to average 0.5 Fabcom responses and a WSUM6 of 18.2; character disorders yielded 0.4 Fabcom responses and a WSUM6 of 11.3. Perry and Viglione (1991) report the mean WSUM6 of inpatient depressives to be lower, at 6.5.

Even within schizophrenic samples, WSUM6 may fluctuate depending on the current symptomatology. DiNuovo, Laicardi, and Torino (1988) divided individuals with schizophrenia into two groups "florid" and "withdrawn". The mean WSUM6 for the "florid" group was 7.3, compared with 2.0 for the "withdrawn"

group. It should be noted that these means are significantly lower than either Exner's or the current study.

In sum, the mean values of Fabcom and WSUM6 may largely depend on the sample being studied. These variables measure cognitive slippage and are more likely in floridly psychotic samples. Finally, the mean values are sensitive to outliers: Fabcom is a nonparametric variable ("J" shaped distribution" and WSUM6 was found to be skewed (and was transformed) currently.

M- (Poor human movement response; disordered thought). A similar reasoning could apply to the lower than expected M- scores (poor human movement). Like Fabcom, M- is a nonparametric variable. The current study found an average of .6 M- (mode=0) responses, compared to 2.4 (mode=1) for inpatient schizophrenics (Exner, 1991). Archer and Gordon (1988) report a slightly lower average of 1.0 M- response for inpatient adolescents diagnosed with schizophrenia. Differences in the frequency of M- scores are important as M- constitutes one criteria on the SCZI index. The differences in frequency of M- responses may be due to the mixed diagnoses: Exner (1991) reports an average of 0.58 M- responses (median=0, mode=0) for inpatient

depressives, a number similar to that found here. A second reason for the difference in M- scores may be the lower than expected value for M (human movement). The present group gave on average 2.85 M responses (median=2.4, mode=0). In comparison, Exner reports an average of 6 (median=6, mode=6) M responses. The reason for the lower number of M responses is unclear. Again, the discrepancy may be due to the mixed diagnoses in the present sample. For instance, Exner (1991) reports an average of 3.6 M responses for inpatient depressives. Sloan and colleagues (1995) report similar values for Persian Gulf War Marines. A third reason may be that the lower average IQ in the present sample (FSIQ=87.9) resulted in fewer human responses. The fact that M- and M are nonparametric variables coupled with the low number of full scale IQ scores make this hypothesis tenuous at best. A final reason for the differing M scores may be scorer error. Scoring M responses can be relatively clear when the action is undertaken by a human. However, M also assigned when an uniquely human action is undertaken by an animal (i.e., an animal *talking*). This second criteria makes scoring more difficult. Examination of interscorer agreement revealed that M assignment differed significantly in only two records, suggesting

that scorer error did not factor heavily in the assignment of M- responses. However, both disagreements were a result of this second criterion.

Interrater Reliability

Rorschach. Although overall interrater reliability was within the recommended limits, a number of examiners fell below the suggested limits in one category. Accuracy of scoring is a crucial issue for both clinical and research purposes. In 36 percent of the records, interscorer disagreements resulted in a different SCZI index score, with the SCZI index changing from non-elevated to elevated in 16% of the records. This large percentage suggests that the SCZI index is vulnerable to rater error. The SCZI index is composed of several variables susceptible to scorer error, most notably form quality and special scores. In the most striking cases, interscorer disagreement resulted in a change in elevation on the SCZI index. One record, an extreme case, demonstrates the sensitivity of the index. Based on one change in form quality (rated as unusual by one examiner and minus by the other) two criteria on the SCZI index changed, resulting in an elevated index.

Special scores are likewise vulnerable to rater

error. While the overall agreement of special scores was acceptable, special score assignment differences changed the SCZI index elevation of two records. This occurred even when special score agreement was within acceptable limits. For example, one record achieved a 90% agreement for special scores, yet differed on assignment of a FABCOM score (assigned level 1 by one examiner and level 2 by the second), which factors directly on the SCZI index. It is noteworthy that special scores assignments, although different, often produced similar Sum 6 and Weighted sum 6 scores. Agreement was best for records with few special scores. As the number and complexity of special scores increased, agreement seemed to decrease. In these cases, however, the large number of special scores often reached the criteria for the SCZI index, making disagreements less relevant for SCZI.

The sensitivity of the SCZI index to scorer accuracy has implications for research and practice. Researchers currently evaluate interscorer agreement within the eight structural summary categories. If adequate agreement is reached, few researchers examine interrater differences in the summary indices. Even when agreement falls within the acceptable limit, errors can effect the research. It is crucial for

researchers to evaluate interscorer agreement for the SCZI index as well as the conventional categories. Research can provide information about common sources of disagreement and give examples of common scoring errors. Practicing clinicians should be aware of common scoring errors, and of the sensitivity of the index to these errors. In addition, clinicians should not rely solely on the index to make clinical decisions (Exner, 1991; Weiner, 1993).

Diagnosis. Diagnostic agreement between the two clinicians as well as discharge diagnosis, was substantial. The major source of disagreements was the diagnosis of schizophrenia versus psychotic NOS. This disagreement highlights the difficulty in assigning diagnosis based on hospital records. Both clinicians gave feedback that the hospital records were lacking in historical information. This presents a problem not only for research, but for appropriate treatment of patients. The hospital is one of many acute-care units in the city. Patients are often unknown to hospital staff, and may be poor historians, particularly upon admission.

Limitations of the current study and future research

There are several limitations to generalizability of the current study. In particular, the current study

applies to an inpatient, inner city sample. The racial composition of the sample was equally divided amongst African-American, Caucasian, and Hispanic. The mean education was slightly below 12 years (median=12 years).

A second limitation is the low number of individuals with a diagnosis of only schizophrenia. This may be due to the use of hospital records to make a clear diagnosis. The hospital records often did not contain enough information about prior psychiatric history to make a differential diagnosis between psychotic disorders. For instance, several individuals were assigned a diagnosis of schizophreniform disorder or psychosis NOS, as prior psychiatric history was not included in the records. A prospective study is needed, in which diagnosis is made independent of assessment, in order to assess the diagnostic accuracy of these measures. It would also be preferable to obtain a sample without a history of significant drug abuse, which may complicate both clinical diagnosis and test results.

Finally, despite a large number of comparisons made, the results are not thought to be spurious for three reasons. First, many of the three of the four planned hypotheses were confirmed. Second, the

relationships which were found were consistent with previous research and current theories of schizophrenia. Finally, many of the relationships had effect sizes compatible with previous findings.

Conclusions

The study demonstrated a relationship between MMPI-2 and Rorschach variables related to psychosis. Individuals with an elevated SCZI index produced an MMPI-2 profile associated with a diagnosis of schizophrenia. Relationships between both measures and a psychotic clinical diagnosis were found. Neither measure in isolation produced both an adequate sensitivity and specificity; the MMPI-2 demonstrated a better sensitivity while the SCZI index yielded better specificity. Simply stated, the MMPI-2 is vulnerable to false positives and the Rorschach is susceptible to false negatives. The combination of the MMPI-2 overdiagnosing schizophrenia with the Rorschach underdiagnosing it may partially explain the poor MMPI-2 /Rorschach relationship to date.

Combining the two measures resulted in an extremely high specificity, with very few false positives. Sensitivity, or false negatives, was only moderate for the combination. Weiner (1993) notes that false negatives should not be a concern in the clinical

application of the Rorschach and MMPI-2. He states that the clinical usefulness of the Rorschach and MMPI can be improved by focusing attention "mainly on conclusions that can be ruled in on the basis of positive findings", while taking care to rule anything out on the basis of absent findings. He further suggests developing a combination of the two instruments which can be refined by both clinical and research applications. Further investigations into the concordance of the two instruments for other symptoms (e.g., depression, anxiety) is needed. Future research should also consider developing ways to combine the instruments which optimally predict diagnosis.

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