The MMPI and Schizophrenia: A Review

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Abstract

Research investigating application of the Minnesota Multiphasic Personality Inventory (MMPI) to schizophrenia is reviewed. This review is organized into five sections: diagnostic issues in schizophrenia; methodological considerations in MMPI research on schizophrenia; historical overview of MMPI research on schizophrenia; current topics in MMPI research on schizophrenia; conclusion. Recommendations are offered for future research and clinical application of research findings.

It is estimated that the lifetime risk for schizophrenia in the general population is about 1 percent. Translating this into numbers reveals that approximately 2 million Americans will suffer from schizophrenia at some point in their lives (National Institute of Mental Health 1972). These figures are staggering when one considers the debilitating nature of this disorder. As a result, such issues as the diagnosis, assessment, and treatment of schizophrenia warrant greater empirical attention than they have thus far received. Along these lines, a number of psychological tests have been studied in an attempt to make the diagnosis of schizophrenic individuals more systematic. While one of these instruments, the Minnesota Multiphasic Personality Inventory (MMPI), has received considerable attention, the results of MMPI-schizophrenia investigations have yet to be organized into a coherent framework. The purpose of the present review is to survey, critically evaluate, and organize MMPI research on schizophrenia in a manner which is useful to researchers and clinicians alike.

Diagnostic Issues in Schizophrenia

The diagnosis of schizophrenia can be both difficult and time consuming. This is partly due to the fact that schizophrenic symptoms generally take time to crystallize, often disappearing and then reappearing without warning (Arana 1978). Two general approaches to the diagnosis of schizophrenia can be identified: the pathognomonic sign approach and the symptom cluster approach. The pathognomonic sign approach is founded on the notion that a finite number of symptoms exist which are found exclusively in schizophrenic individuals. The symptom cluster approach, on the other hand, maintains that while certain behavioral features may be more prevalent in schizophrenia, it is the number and configural relationship of these symptoms which actually defines schizophrenia.

Bleuler (1950) developed one of the first pathognomonic systems of schizophrenia and referred to his paramount signs as the primary symptoms of schizophrenia: loose associations, flat or inappropriate affect, autism, and ambivalence. Schneider's (1959) first-rank criteria (three kinds of auditory hallucinations, thought insertion, thought withdrawal, thought broadcasting, delusional perceptions, somatic passivity, and perception that certain feelings, impulses, and volitions have

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been imposed upon one by an external force) also involve a pathognomonic approach to the diagnosis of schizophrenia. Despite the current popularity of Schneider's approach, empirical investigations into the system's viability have produced mostly negative results (Mellor 1970; Carpenter, Strauss, and Muleh 1973; Carpenter and Strauss 1974; Kendell, Brockington, and Leff 1979; Silverstein and Harrow 1981; Stephens et al. 1982). Probably the most conservative pathognomonic approach was the one developed by Langfeldt (1939). He proposed a limited number of pathognomonic symptoms (e.g., severe depersonalization, somatic hallucinations, delusions of persecution, autism) which must be "fully experienced" by the patient before being considered present.

In response to the questionable validity of pathognomonic sign systems Yusin, Nihira, and Mortashed (1974) developed an approach to schizophrenic diagnosis which involved symptom combinations or clusters. They identified a number of major symptoms (i.e., loose associations, autism, delusions, hallucinations, loss of ego boundaries, and social withdrawal) and minor symptoms (e.g., anxiety, concrete thinking, flat affect) which in various combinations are suggestive of schizophrenia. Along these same lines, Newmark et al. (1975) discovered that a discriminant function consisting of four symptoms (loose associations, loss of ego boundaries, autism, and delusions) correctly identified 97 percent of their sample as either schizophrenic or nonschizophrenic. Carpenter, Strauss, and Bartko (1973), using the Present State Examination (PSE) and data collected as part of the International Pilot Study of Schizophrenia (IPSS), developed a 12-sign "Flexible" system for the diagnosis of schizophrenia, nine signs being correlated with schizophrenia (i.e., restricted affect, poor insight, thoughts aloud, poor rapport, widespread delusions, incoherent speech, unreliable information, bizarre delusions, and nihilistic delusions) and the other three signs being suggestive of nonschizophrenia (i.e., waking early, depressed facies, and elation). They determined that a cutting score of 5 (presence of 5 or more symptoms being indicative of schizophrenia) correctly identified 81 percent of the schizophrenics and 78 percent of the nonschizophrenics in their cross-validation sample. A primary advantage of the Flexible system is the ability to adjust the inclusiveness of the system through manipulation of the cutting score. Research investigating the empirical validity of the Flexible system has met with mixed results (cf. Kendell, Brockington, and Leff 1979; Fenton, Mosher, and Matthews 1981; Stephens et al. 1982).

Research has generally supported the symptom cluster approach over the pathognomonic sign approach. For instance, Newmark et al. (1976) compared the relative performance of symptom cluster and pathognomonic sign approaches in discriminating between 108 schizophrenics and 227 nonschizophrenics. They observed that the two cluster systems (Yusin, Newmark) discriminated between schizophrenics and nonschizophrenics at a much higher rate than did the pathognomonic systems (Bleuler, Schneider).

In an extensive review of the literature on schizophrenia and manic-depressive illness, Pope and Lipinski (1978) noted that several putative pathognomonic schizophrenic symptoms—delusions, hallucinations, and Schneider's first-rank symptoms—are found in 20 to 50 percent of well-documented cases of manic-depressive illness. Such findings limit the applicability of the pathognomonic approach to schizophrenic diagnosis.

Although symptom cluster approaches have received more empirical support than have pathognomonic sign approaches, Pope and Lipinski (1978) suggest that American psychiatry/psychology has placed too much emphasis on "schizophrenic" symptoms which has resulted in an overdiagnosis of schizophrenia and an underdiagnosis of manic-depressive illness. Moreover, Pope and Lipinski reported that "schizophrenic" symptoms are generally ineffective in differentiating between schizophrenic and manic-depressive individuals and in predicting prognosis. In fact, they report that many "good prognosis schizophrenics" may actually be suffering from a significant affective disorder; they support their claim with family history studies and studies investigating response to lithium carbonate therapy. Pope and Lipinski conclude that because "schizophrenic" symptoms are largely nonspecific, the diagnostician needs to supplement these data with additional information (e.g., premorbid adjustment, family history, and course of illness) before arriving at a diagnostic decision.

The *DSM-III* (American Psychiatric Association 1980) criteria for schizophrenia, which are based largely on the St. Louis criteria (Feighner et al. 1972) and the New York Research Diagnostic Criteria (RDC; Spitzer, Endicott, and Robins 1975), consider symptom (e.g., delusions, hallucinations, and seriously disorganized thought) as well as nonsymptom (e.g., duration of symptoms and age at onset) types of information. The intercorrelations among the RDC, *DSM-III*, and St. Louis criteria for schizophrenia tend to be quite

high (Stephens et al. 1982). Moreover, as is the case with the RDC and St. Louis criteria, *DSM-III* is much narrower than *DSM-II* (American Psychiatric Association 1968) in its definition of schizophrenia, reflecting a strong European, predominantly British, influence (Cooper et al. 1972). Research suggests that the RDC, *DSM-III*, and St. Louis criteria produce relatively homogeneous samples of schizophrenics and that they tend to be more accurate predictors of long-term outcome relative to other diagnostic systems currently in use (Fenton, Mosher, and Matthews 1981; Stephens et al. 1982). The question remains, however, whether the MMPI is capable of contributing useful information as part of a larger diagnostic system like the RDC or *DSM-III*.

Haier et al. (1979) asked 385 college males to complete the MMPI and then interviewed those individuals (index cases) who showed an elevation ($\geq$ *T*-score of 80) on at least one MMPI scale ($n = 56$). A sample of 29 subjects who failed to show an elevation on any MMPI scale above a *T*-score of 69 was employed as the control group. The Schedule for Affective Disorders and Schizophrenia, lifetime version (SADS-L; Endicott and Spitzer 1978) was used to determine whether any of those college students met RDC criteria for the presence of psychopathology. Haier et al. noted that 82 percent of the index and 22 percent of the control cases fit at least one RDC category, a highly significant difference. This study suggests that the MMPI is capable of detecting psychopathology in nonhospitalized subjects when a standardized, relatively narrow definition of psychopathology is used (i.e., the RDC).

While the results of the Haier et al. (1979) study are encouraging, an important question yet to be addressed is whether the MMPI is applicable to *DSM-III* schizophrenics. In an attempt to answer this question, Winters, Weintraub, and Neale (1981) compared the concordance between diagnosis and Marks, Seeman, and Haller's (1974) code types for schizophrenics diagnosed under *DSM-II* and *DSM-III* criteria. While Marks, Seeman, and Haller's (1974) schizophrenic code types concurred 61.3 percent of the time with *DSM-II* diagnoses of schizophrenia, the concurrence between code types and *DSM-III* diagnoses of schizophrenia was only 37.1 percent. Concordance rates for *DSM-II* and *DSM-III* diagnoses of schizophrenia and MMPI code types were found to be significantly different. The authors concluded that the MMPI may not be useful in identifying schizophrenia as defined by *DSM-III*.

While the study of Winters, Weintraub, and Neale (1981) raises many interesting questions, several issues need to be considered. First, they employed the Mini-Mult as an estimate of the full MMPI. Using an MMPI short form as an estimate of the standard form presents several problems (see Faschingbauer and Newmark 1978). In general, research on MMPI short forms has produced equivocal findings (cf. Overall, Higgins, and DeSchweinitz 1976; Poythress and Blaney 1978), although Hoffmann and Butcher (1975) found them extremely limited in comparison to the full MMPI. It should be noted that even advocates of the short form approach to the MMPI seriously question the utility of the Mini-Mult (the form used by Winters, Weintraub, and Neale) with any type of patient (cf. Newmark 1981).

Second, Winters, Weintraub, and Neale discarded potential subjects who exceeded a *T*-score of 70 on any of the validity scales. This criterion may be overly rigid, and it is speculated that many of the subjects discarded were schizophrenics who showed an elevated scale *F* as part of their personality style. Third, Winters, Weintraub, and Neale investigated high-point pair combinations instead of studying the entire MMPI configuration. Research suggests that when a code-type approach is used instead of relying upon all 13 MMPI scales, there is considerable loss of information and a decrement in empirical validity (Holland, Levi, and Watson 1981).

Finally, Winters, Weintraub, and Neale did not really evaluate the appropriateness of the MMPI for use with *DSM-III* schizophrenics but, rather, determined that a system based upon *DSM-II* criteria (i.e., Marks, Seeman, and Haller 1974) was not generally useful in identifying *DSM-III* schizophrenics. This finding is not at all surprising given that *DSM-II* and *DSM-III* are based on two very different conceptualizations of schizophrenia.

Walters (1982) compared schizophrenic, schizophreniform, and primary affective disorder inpatients diagnosed under *DSM-III* on all 13 standard MMPI scales. Multivariate analysis of covariance revealed no significant differences between schizophrenics and affectively disturbed patients on the standard MMPI scales, although schizophrenic patients did produce significantly more *6-8/8-6* high-point pair combinations. Schizophrenic and schizophreniform individuals, on the other hand, achieved significantly different scores on the MMPI, with schizophrenic patients tending to achieve higher overall elevations on the clinical scales. It is interesting that significantly more schizophrenic patients

(77.2 percent) earned high-point pairs containing Scale *8* (*Sc*) relative to both schizophreniform (47.2 percent) and affectively disturbed patients (46.8 percent).

Whether the MMPI is applicable to *DSM-III* schizophrenics is a question which requires further study. However, a recent article by Johnson, Klingler, and Giannetti (1980) is encouraging because they found the MMPI to be more predictive of narrow band, as opposed to broad band, diagnostic categories. For this reason it is speculated that the MMPI may be more applicable to the much narrower *DSM-III* concept of schizophrenia than has been the case with *DSM-II* schizophrenia.

Another important issue is whether schizophrenia is a single disorder or a collection of separate but related disorders. There is recent evidence to suggest that there may be several different subtypes of schizophrenia based on etiology—one type being associated with a strong family background of schizophrenia, another type involving perinatal cortical damage, and still another relying heavily upon environmental/social influences (see Kinney and Jacobsen 1978). The MMPI could be helpful in sorting out the various influences if it were found capable of discriminating between these various subgroups (assuming, of course, that these subgroups actually exist). However, in the one area in which the MMPI, in the form of the *Sc-0* scale (Watson 1971), has been used in this way ("organic" vs. "nonorganic" schizophrenics) the results have not been encouraging (Holland, Lowenfeld, and Wadsworth 1975; Halperin et al. 1977).

Methodological Considerations in MMPI Research on Schizophrenia

One major methodological problem found in MMPI research on schizophrenia is that the criteria used to establish a diagnosis of schizophrenia have varied across studies. When one considers Pope and Lipinski's (1978) contention that symptom approaches to the diagnosis of schizophrenia are highly nonspecific, one wonders how comparable the different studies really are. The majority of MMPI studies on schizophrenia, and even several studies used to develop schizophrenic diagnostic systems (e.g., Yusin, Nihira, and Mortashed 1974; Newmark et al. 1975), have employed as the criteria for schizophrenia the clinical judgment of one or more mental health professionals. Before the development of the New York RDC, St. Louis criteria, and *DSM-III* there was very little agreement as to what constituted schizophrenia and a great deal was left up to the discretion of the individual clinician. The development of standardized interview procedures (e.g., the Present State Examination and the SADS) and the implementation of computer-mediated decision models like CATEGO (see Wing and Nixon 1975) would probably serve to make criterion diagnoses more standardized and studies in this area more comparable.

Criterion contamination is also an important consideration in future MMPI research on schizophrenia. A number of studies cited in this review established criterion diagnoses after inspecting the MMPI profiles of subjects. While the influence of the MMPI on the criterion diagnoses is difficult to determine in most cases, its typical effect may involve an inflation of the hit rate achieved by an MMPI scale or index, since the criterion predicted (i.e., schizophrenia) was established, in part, by elevations on the predictor (i.e., MMPI). It is imperative that investigators maintain the independence of criterion and predictor in future research studies.

It is also important to consider the criteria used to establish the "validity" of an MMPI profile for the purposes of inclusion in a research project. One frequently encountered criterion concerns the elevation of the MMPI *F* scale. For example, Meehl and Dahlstrom (1960) employed a score > 80 on *F* and Winters, Weintraub, and Neale (1981) an *F* score > 70 to exclude potential subjects from their respective studies. Such a procedure seems unduly rigid and may eliminate important diagnostic information as was found by Apfeldorf and Hunley (1975) in their study on *F* scale elevations and alcoholism. While it is the author's contention that the *F* scale (except at extreme elevations, e.g., > 110) should not be employed as a measure of profile "validity," this does not mean that screening should not take place. One useful criterion of profile validity concerns the number of omitted items (Scale *?*). The number of omitted items should probably not exceed 30 since, as Greene (1980) has noted, the principal effect of unanswered items on the MMPI involves a suppression of the scale elevations (except for *Mf* in females which is increased by omissions). A measure of inconsistent or random responding may also be useful. The *T-R* Index (Greene 1980) is a good measure of inconsistent responding since it involves the total number of repeat items on the MMPI responded to inconsistently (e.g., true the first time and false the second time).

Oftentimes, the methodological or statistical procedures used in research studies in this area have been inappropriate. For instance, Aaronson and Welsh (1950) questioned the appropriateness of using an analysis of variance (ANOVA) design to contrast the four diagnostic groups in the study of Rubin (1948). In a reanalysis of Rubin's original data, Aaronson and Welsh asked 12 judges to sort the four mean profiles—alcoholic, character disorder, neurotic, and psychotic—into their respective diagnostic categories. In contrast to Rubin's largely negative results, Aaronson and Welsh discovered that their procedure yielded a success rate of 100 percent. With recent advances in both statistics and computer science, multivariate techniques, like discriminant analysis, multiple regression, and factor analysis, are preferable to performing a series of separate *t* tests or ANOVAs. If future MMPI research on schizophrenia is to be clinically relevant, methodology will need to be refined and statistical procedures properly applied.

An issue that is often overlooked by MMPI researchers concerns the state dependency of various MMPI scales. That is, certain MMPI scales tend to measure relatively enduring personality traits (e.g., *Pd*, *Pt*), whereas others are more sensitive to transient states like situational distress, confusion, and reactive depression (e.g., *F*, *D*, *Sc*). While all scales are susceptible to state influences, certain scales are much more sensitive than others to these effects. Thus, a high score on *Sc* may reflect a thought disturbance or it may be elevated primarily because of situational distress and confusion. Taking note of the relative elevation of other MMPI scales, the actual level of *Sc*, and certain nontest variables (e.g., reason for the evaluation, behavior during interview) can help separate out these influences. Researchers and clinicians should be sensitive to the effects of transient states on MMPI results.

Dahlstrom (1972) has proposed that the use of more "pure" state and trait measures on the MMPI should enhance the test's empirical utility. He hypothesized that the Tryon-Stein-Chu (TSC) cluster scales (Stein 1968) were relatively pure measures of state or symptom-status variables. Haan's (1965) ego defense scales, on the other hand, were proposed as trait or characterological measures. Klingler et al. (1977) were unable to find support for this hypothesis, however. That is, a set of 10 state (TSC) and trait (Haan) scales plus the three standard MMPI validity scales failed to outperform the 13 standard MMPI clinical and validity scales in terms of diagnostic accuracy. Klingler et al. acknowledged the many limitations of their design and speculated that the use of a different methodology and/or state and trait measures may achieve results more consistent with Dahlstrom's position. Further research is necessary to clarify whether state and trait measures are a useful addition to the standard MMPI scales.

Meehl and Rosen (1955) raised an important methodological issue in their discussion of base rates, prediction, and the MMPI. They recommend that the performance of a scale or index be compared with that achieved through knowledge of the diagnosis' prevalence in the population being investigated. For example, if the *SC-0* scale achieved a hit rate of 65 percent in a setting where 70 percent of the patients are schizophrenic, one should question the practical utility of the *Sc-0* scale in that particular setting since it was unable to improve upon the simple base-rate prediction that all patients would be schizophrenic. Gilbertstadt (1971) noted that 75 percent of the schizophrenics in his VA psychiatric inpatient sample had previous diagnoses of schizophrenia. The question then is, can the MMPI augment this 75 percent hit rate when combined with previous diagnosis? If not, it would be of doubtful utility in this situation. Investigators need to be more mindful of base rates when doing research on schizophrenia using the MMPI.

Finally, Butcher and Tellegen (1978), in a review of common methodological problems in MMPI research, discuss several issues relevant to MMPI research on schizophrenia. For instance, they maintain that instead of developing even more special MMPI scales, we need to begin investigating existing special scales in greater detail. They recommend use of the following criteria in evaluating special MMPI scales: The MMPI item pool should adequately cover the construct to be measured; the scale should be conceptually meaningful; the scale should be developed and cross-validated using a reasonably large sample; estimates of internal consistency should be reported and external validation data collected. Butcher and Tellegen state that since MMPI research is correlational in nature, we need to know more than the presence of a statistically significant relationship; we need to know the strength of that relationship. They add that this can be accomplished statistically through the use of correlation coefficients, hit rates, and confidence intervals. Before conducting research on the MMPI, potential investigators are encouraged to review Butcher and Tellegen's (1978) article.

Historical Overview of MMPI Research on Schizophrenia

One of the first studies contributing to the MMPI literature on schizophrenia was conducted by Rubin (1948). Rubin examined the MMPI response patterns of schizophrenics, alcoholics, character disorders, and neurotics and failed to observe any significant group differences except for *?* (Cannot Say scale), on which schizophrenics earned significantly higher scores. Rubin concluded that the MMPI is of limited diagnostic value, at least for use in an inpatient setting. While Rubin's conclusions have been criticized along several different lines (cf. Aaronson and Welsh 1950; Rosen 1958), the results did raise some initial concern about the utility of the MMPI as applied to schizophrenia.

Two years after the Rubin study, Wauck (1950) set out to investigate the relationship between schizophrenia and the *Sc* (schizophrenia) scale of the MMPI. He discovered that only 41 percent of a sample of 80 schizophrenic inpatients elevated *Sc* above a *T*-score of 70. In addition, fewer than 20 percent of the schizophrenics achieved elevated *Sc* scores which were also the highest point on the profile. This study, in conjunction with earlier unsuccessful attempts to separate schizophrenics and nonschizophrenics on the basis of *Sc* scores (e.g., Hathaway and McKinley 1940), led many clinicians to conclude that scores on the *Sc* scale were not generally useful in diagnosing schizophrenia.

Mindful of the limitations inherent in using the *Sc* scale alone to predict schizophrenia, Benarick, Guthrie, and Snyder (1951) developed an 11-item scale designed to discriminate between schizophrenic and nonschizophrenic individuals who showed an elevation on the *Sc* scale. In the construction of this scale, hospitalized psychotics and college students were matched on *Sc* and then compared. The 11 items which distinguished between these two groups of subjects were subsequently organized into a scale. A cutting score of 3 (scores ≥ 3 being classified as schizophrenic) correctly identified 77.5 percent of the subjects in the cross-validation sample. However, subsequent research has failed to support the empirical utility of this scale (cf. Rubin 1954; Quay and Rowell 1955).

A critical problem with the Benarick scale was the way in which it was constructed; that is, Benarick, Guthrie, and Snyder (1951) employed a "normal" control group rather than using a group of psychiatric controls. Therefore, in developing his scale, Peterson (1954) used three groups of psychiatric patients: (1) patients diagnosed nonschizophrenic by a mental hygiene psychologist and later hospitalized with a diagnosis of schizophrenia (false negatives); (2) nonschizophrenics matched with the false negative group on mental hygiene diagnosis (true negatives); and (3) patients diagnosed "latent" or "incipient" schizophrenia by a mental hygiene psychologist and later hospitalized with a schizophrenic diagnosis (true positives). Peterson failed to observe any significant differences between the performance of false negatives and true positives on any of Meehl's (1946) six signs, suggesting that both were similar in terms of psychopathology (i.e., schizophrenia). However, he did witness significant differences between false negatives (subclinical schizophrenia) and true negatives (nonschizophrenics) on all six signs.

Peterson's (1954) six rules are as follows:

1. *T*-score > 70 on at least four scales.
2. $F > 65$.
3. $Sc > Pt$.
4. Pa or $Ma > 70$.
5. Pa or Sc or $Ma > Hs$ and D and Hy.
6. $D > Hs$ and Hy.

The percentage of accurate classifications (schizophrenic-nonschizophrenic) achieved by the Peterson signs has varied between 60 and 88 percent (Peterson 1954; Affleck and Garfield 1960; Winter and Stortroen 1963; Goldberg 1965; Goodson and King 1976; Giannetti et al. 1978). It should be noted that the two studies recording the lowest accuracy figures for the Peterson signs (i.e., Goldberg 1965; Giannetti et al. 1978) employed heterogeneous samples of psychotic patients. It is speculated that had these investigators limited their studies to schizophrenics, the hit rate achieved by the Peterson signs would have been better. Peterson states that his six rules were designed to detect subclinical schizophrenia; however, only Haier, Rosenthal, and Wender (1978) investigated the utility of the Peterson signs in a sample of individuals at risk for the development of schizophrenia but not currently exhibiting clinically significant psychopathology. While more index (23 percent) than control (17 percent) cases satisfied three or more of the Peterson rules, this difference was not statistically significant.

Eichman (1959) developed an MMPI schizophrenia index by contrasting female schizophrenics and nonschizophrenics in a psychiatric facility on a series of signs. These signs involved either the relative elevation of a particular scale (e.g., $D \leq 62$) or the relationship between two scales (e.g., $Sc\text{–}Pt \geq 3$). These signs were organized into five internally

consistent categories and a discriminant analysis was performed. The weights calculated for each category were then applied to individual profiles in order to achieve a total score. A cutting score of 46 correctly identified 74 percent of the standardization group, with a false positive rate of 10 percent and a false negative rate of 16 percent. These rules were cross-validated in two separate samples with 79 percent and 74 percent of the cases being correctly identified.

Following the lead of Peterson (1954), Taulbee and Sisson (1957) developed a configural scale for the differential diagnosis of schizophrenia and neurosis. It consists of 16 scale pairs which when summed yield a total score. On this scale, lower scores are associated with schizophrenia (< 7), while higher scores are indicative of neurosis (> 12). Taulbee and Sisson recommend use of an indeterminant category when scores fall between 7 and 12. Cross-validation of this scale revealed an exceptionally high accuracy rate of 90 percent (Taulbee and Sisson 1957).

Mixed empirical findings have been achieved using the Taulbee-Sisson signs. While two studies found the scale incapable of discriminating between neurotics and schizophrenics (Winter and Stortroen 1963; Giannetti et al. 1978), the use of an indeterminant category has elevated the scale's hit rate to somewhere between 63 and 94 percent in several other investigations (Taulbee 1958; Garfield and Sineps 1959; Goldberg 1965). This heterogeneity of results may be explained, at least in part, by sample characteristics. The Taulbee-Sisson signs were developed on a population of male veterans being cared for at a VA teaching hospital, whereas several of the validation studies employed patients from other settings (e.g., state hospitals, outpatient clinics). Zigler, Levine, and Zigler (1976) have pointed out that schizophrenics found in VA hospitals are different from many schizophrenics in other settings by virtue of the fact that they were able to get themselves inducted into the military, not to mention differing diagnostic practices across treatment settings. Moreover, Zigler, Levine, and Zigler found VA schizophrenics to have had better premorbid adjustment and to have developed symptoms at a later age relative to the "typical" schizophrenic found in a state hospital setting.

Meehl and Dahlstrom (1960) developed a neurotic-psychotic scale involving various MMPI scale relationships, with all profiles being classified as either neurotic, psychotic, or indeterminant. While the scale was not specific to schizophrenia, the two studies in which schizophrenics comprised the entire psychotic cell found the classification accuracy of the Meehl-Dahlstrom rules to be 61 percent (Winter and Stortroen 1963; Ritter 1974). In an expansion of the Meehl-Dahlstrom rules, Henrichs (1964) added a fourth category, character or behavior disorders.

Goldberg (1965), dissatisfied with the performance of configural rules and clinical judgment in discriminating between neurotic and psychotic individuals, developed a simple linear index composed of five MMPI scales ($L + Pa + Sc - Hy - Pt$). Although the Goldberg index has yet to receive much empirical attention, it has been found to outperform such configural approaches as the Taulbee-Sisson signs and Meehl-Dahlstrom rules (cf. Giannetti et al. 1978). Even though Goldberg (1972) revised his index with apparently good results, the implications for schizophrenia researchers are limited due to the broad band nature of the Goldberg index (i.e., neurotic-psychotic).

A variety of MMPI scales and indices have been developed in an attempt to discriminate between schizophrenic and brain-damaged individuals (Watson and Thomas 1968; Watson 1971; Russell 1975; Watson and Plemel 1978). Probably the most popular of these scales is Watson's (1971) 80-item *Sc-0* scale. The hit rate achieved by this scale has varied between 63 and 83 percent (Watson 1971, 1973; Ayers, Templer, and Ruff 1975; Neuringer, Dombrowski, and Goldstein 1975; Golden, Sweet, and Osmon 1979). While the performance of some of these MMPI schizophrenic-organic indices is moderately impressive, their clinical utility is limited by the fact that there seems to be significant organic involvement in a large percentage of schizophrenic cases (Crow, Ferrier, and Johnstone 1979). Furthermore, as was pointed out earlier, Halperin et al. (1977) and Holland, Lowenfeld, and Wadsworth (1975) were unable to distinguish between schizophrenics with and without neurological findings using the *Sc-0* scale. Perhaps researchers in this area are using methodology which is poorly equipped to answer the questions they are asking, or perhaps the questions they are asking are oversimplified and misleading. It may make more sense to consider a wide range of different variables (e.g., familiar climate, genetic history, season of birth, computed tomography) and investigate how these variables interface with the MMPI to form a complex interaction with relevance to diagnosis and behavior.

Recently, Newmark et al. (1978) attempted to construct a comprehensive MMPI index for identifying schizophrenia. They had three Ph.D. clinical psychologists evaluate patients using the Newmark et al. (1975) symptom cluster system to

diagnose schizophrenia. The final sample consisted of 284 (146 male, 138 female) schizophrenic inpatients and 1,485 nonschizophrenic inpatients diagnosed using the discriminant analysis rules found in the Newmark et al. (1975) system. A prediction of schizophrenia using the MMPI was made when all four of the following criteria were satisfied: (1) *T*-score on *Sc* ≥ 80 ≤ 100; (2) *T*-score on *F* ≥ 75 ≤ 95; (3) *T*-score on *Sc* ≥ *Pt*; (4) *K* items contribute no more than 35 percent to the *Sc* *T*-score. It was determined that 72 percent of the male and 71 percent of the female schizophrenics achieved the above criteria, whereas only 5.5 percent of the nonschizophrenics were classified schizophrenic by the index. Newmark et al. remarked that manic-depressive, brain-damaged, and drug-dependent patients were the nonschizophrenic groups most often misdiagnosed by this MMPI index.

During the early 1960s a research trend began in which investigators attempted to construct special MMPI scales that would answer more specific diagnostic questions than could be answered by the standard MMPI scales alone. Rosen's (1962) Paranoid Schizophrenia (*Pz*) scale is one such example. The 64-item *Pz* scale was developed by contrasting 67 paranoid schizophrenics and 140 general psychiatric patients (excluding all patients with a diagnosis of paranoid schizophrenia) on the MMPI. In a cross-validation study, Rosen discerned that the *Pz* scale correctly identified 46 percent of a group of schizophrenics and 93 percent of a group of psychiatric controls (cutting score ≥ 60). Rosen observed that by adding a percentage of scale *K* to *Pz* (*Pz* + *1K*) he could raise the schizophrenic hit rate to 53 percent without affecting the hit rate for nonschizophrenics (93 percent). While very little subsequent research has been conducted on *Pz*, Gottesman and Shields (1972) reported that *Sc* + *1K* was a more effective predictor of clinical as well as subclinical schizophrenia relative to *Pz* + *1K*.

Over the past 20 years numerous research studies have demonstrated that elevations on *Sc* are often associated with schizophrenia (Dahlstrom and Prange 1960; Sines, Silver, and Lucero 1961; Braatz 1970; Davis, Beck, and Ryan 1973; Groesch and Davis 1977; Golden, Sweet, and Osmon 1979; Holland and Watson 1980; Holland, Levi, and Watson 1981); however, several other studies have failed to support the notion of a relationship between schizophrenia and *Sc* (cf. Rubin 1948; Wauck 1950). Attempts have also been made to document the high-point pairs commonly found in individuals diagnosed schizophrenic. Dahlstrom and Prange (1960) found the *6-8/8-6* and *4-6/6-4* pairs to be the two most common high-point pairs in a sample of paranoid schizophrenics. Holland, Levi, and Watson (1981), on the other hand, observed the *2-8/8-2* high-point pair to be the most frequent configuration in a heterogeneous sample of schizophrenic inpatients. In support of this study, several researchers have reported the mean high-point pair in various samples of schizophrenia to be the *2-8/8-2* combination (Rosen 1958; Braatz 1970; Holland and Watson 1978).

There is a need for research into the standard scale, special scale, and high-point correlates of schizophrenia. Nowhere is the heterogeneity of schizophrenia more evident than in research on MMPI high-point pairs. Authors of the various MMPI systems (e.g., Gilberstadt and Duker 1965; Gynther, Altman, and Sletten 1973; Marks, Seeman, and Haller 1974) have documented a variety of high-point correlates of schizophrenia. This heterogeneity may have its foundation in the broad definitions applied to schizophrenia before the introduction of such systems as the RDC and *DSM-III*. For example, Marks, Seeman, and Haller (1974) report on seven high-point pairs in which over half of the patients are diagnosed schizophrenic under *DSM-II* (i.e., *2-7-8/8-7-2, 2-8/8-2, 4-6/6-4, 4-8-2/8-4-2/8-2-4, 6-8/8-6, 8-9/9-8, 6-9/9-6*). However, when the behavioral correlates of these high-point pairs are inspected, only one (i.e., *6-8/8-6*) appears to fit the *DSM-III* definition of schizophrenia. Even here there is a discrepancy, for Marks, Seeman, and Haller (1974), in discussing the *6-8/8-6* patient, report that the "onset of . . . disorder is typically quite short" (p. 124). Using *DSM-I* nosology, Gilberstadt and Duker (1965) identified five (*1-3-8, 2-7-8, 8-1-2-3, 8-6, 8-9*) and Stelmachers (in Lachar 1974) identified nine (*2-7-8, 2-8, 8-3, 8-6, 9-6, 8-7, 8-9, 4-6-8, 4-8-2*) high-point combinations associated with schizophrenia, although only the *8-6* pattern fits the *DSM-III* concept of schizophrenia, behaviorally. This supports the findings of Walters (1982), who found that only the *6-8/8-6* high-point pair discriminated between schizophrenic and affectively disturbed patients, with significantly more schizophrenics achieving the *6-8/8-6* high-point combination. It may be, then, that the heterogeneity of earlier concepts of schizophrenia has led to the proliferation of MMPI high-point pairs associated with it. Only further research will reveal whether the narrower diagnostic criteria now in use will be of benefit to MMPI researchers attempting to study schizophrenia.

In an extension of the high-point pair approach, Gilberstadt (1971) developed his "*P*-scales." These *P*-scales were originally designed to reflect the various high-point pairs found in Gilberstadt and Duker's (1965) codebook. Items were selected in an attempt to identify six nonoverlapping *P*-scales. A seventh *P*-scale, based on Gilberstadt and Duker's *2-7-8* high-point triad, was added as a measure of general psychological maladjustment. The two *P*-scales most relevant to schizophrenia were the 7th *P*-scale and a scale based on the Gilberstadt and Duker (1965) *8-6* high-point pair (*P*-scale 5). *P*-scale 5 was subsequently found to be ineffective because it produced a very constricted range of scores. However, Gilberstadt reported mild success using *P*-scale 7 to identify schizophrenia and moderate success using various nonschizophrenic *P*-scales (e.g., 14,41) as reflective of nonschizophrenia.

Current Topics in MMPI Research on Schizophrenia

A variety of more current topics involving direct application of the MMPI in the diagnosis, treatment, and better understanding of the schizophrenic syndrome can be identified. Five current research topics will be discussed: moderator variables; measuring and predicting response to treatment; schizotaxia; linear versus configural rules of MMPI classification; and multiple variable input.

Moderator Variables. Much of the MMPI research conducted on schizophrenics has employed relatively young, male, white schizophrenics. Thus, the question of generalizability of results to older, female, and nonwhite populations is a relevant one. While age, sex, and race are the moderator variables studied most by investigations in this area, two additional variables, marital status and religion, are also important.

Age. Since the majority of MMPI research conducted on schizophrenics was done using subjects younger than 35 or 40 years of age, it is possible that elderly schizophrenics may respond somewhat differently to the MMPI. This is exactly what Wauck (1950) found in a group of 16 schizophrenics between the ages of 40 and 53. He reported that older schizophrenics demonstrated less pathologically disturbed MMPI profiles, witnessed by lower scores on all standard MMPI scales with the exception of *K*. A "leveling off" phenomenon in which older schizophrenics achieved scores approaching "normality" was clearly evident. The younger schizophrenics (ages 15-29), on the other hand, evidenced diminished defensiveness and decreased control over their impulses according to the results of the MMPI.

While Davis (1972) found the MMPI capable of discriminating between young (ages 18-28) schizophrenics and nonschizophrenics, he discovered that it was unable to do the same in a sample of elderly patients (ages 45-56). It is possible that chronicity, rather than age, played the influential role in these results, since elderly schizophrenics also tend to be more chronic. The results of a second study carried out using patients suffering episodes of acute schizophrenia (i.e., newly admitted, spent less than 3 percent of their lives in hospital), however, argue against this hypothesis. Davis, Mozdzierz, and Macchitelli (1973) found the MMPI capable of making schizophrenic-nonschizophrenic determinations in the younger acute group (ages 18-29), but not in the older acute group (ages 45-59). It could be argued, nonetheless, that the older schizophrenics were still more chronic, but that their condition had only just recently come to professional attention, since the development of an acute schizophrenic condition at the age of 50 flies in the face of current psychiatric opinion. In any event, the Davis (1972) and Davis, Mozdzierz, and Macchitelli (1973) studies, when considered together, suggest that the "leveling off" and "loss of discriminative power" effects observed on the MMPIs of schizophrenics of advancing age are probably not due to long-term hospitalization.

The results of a study by Newmark and Hutchins (1980) further support the notion that the MMPI loses discriminative power when applied to elderly schizophrenics. As reviewed earlier, Newmark et al. (1978) developed an MMPI index useful in discriminating between groups of schizophrenic and nonschizophrenic inpatients. However, Newmark and Hutchins found the index capable of correctly identifying only 22 percent of a group of elderly schizophrenics between the ages of 44 and 54.

Miller and Paciello (1980) examined age differences on the MMPI by comparing young (ages 19-30) and old (ages 48-62) schizophrenics and then contrasting these groups with nonschizophrenics of comparable age. Results indicated that younger schizophrenics achieved higher scores than older schizophrenics on *Hs* and *Pa*. However, even more interesting results surfaced when the discriminative power of the MMPI was tested across diagnostic groups. The young schizophrenics recorded higher scores on *K* and *Ma* relative to their nonschizophrenic counterparts, suggesting to Miller and Paciello compulsivi-

ty and a greater power orientation on the part of younger schizophrenics. Older schizophrenics were observed to earn higher scores on *Hs* and *Hy* compared with older nonschizophrenics. Miller and Paciello interpret these differences as reflecting the presence of a long history of insecurity and a tendency toward somatisizing in elderly schizophrenics. One should be aware, however, that some of these differences were in all likelihood due to chance since 52 separate *t* tests were calculated.

The evidence suggests that elderly schizophrenics earn less pathological MMPI profiles relative to younger schizophrenics. The "leveling off" effect observed in many older schizophrenics may be partly responsible for a decrease in the discriminative power of the MMPI that is frequently encountered when the MMPI is used in groups of elderly schizophrenics. The results of a number of investigations suggest that caution should be used in implementing the MMPI in groups of schizophrenics over the age of 40, regardless of whether they are hospitalized.

Sex. Several of the differential diagnostic scales and indices found capable of identifying male schizophrenics have not been equally successful in samples of female schizophrenics (e.g., Watson and Thomas 1968; Watson 1971). However, very little research has been conducted on the question of whether the MMPI as a whole is differentially valid for male and female schizophrenics. In one study, Goodson and King (1976) found that female psychotics earned significantly higher scores on *Pa*, whereas male psychotics recorded higher scores on *Pt*, *Sc*, and *Si*. Gottesman and Shields (1972) state that the results of their study suggest that sexual identification, as measured by the *Mf* scale, is disrupted in male schizophrenics, but not in female schizophrenics. Haier, Rosenthal, and Wender (1978) found that schizophrenic spectrum males presented as more disturbed on the MMPI relative to spectrum females.

Race. Clark and Miller (1971) determined the behavioral correlates of the *8-6* profile in a sample of 10 black schizophrenics residing in a VA hospital. The cardinal features of paranoid schizophrenia, as observed by Gilberstadt and Duker (1965) in a sample of white VA inpatients achieving the *8-6* pair, were present. However, some differences were noted on various secondary traits and symptoms. For instance, the black schizophrenics displayed greater interpersonal difficulties and reported more "odd" or "bizarre" experiences compared with the white patients (Clark and Miller 1971). Thus, while some differences were noted, the central or focal behavioral correlates of the *8-6* high-point pair did not vary across racial conditions.

An interesting interaction has been observed between race and another moderator variable, education. It has generally been observed that when educational level is controlled for, the race-related MMPI variations frequently observed tend to disappear (Davis, Beck, and Ryan 1973; Davis 1975). For instance, while black-white differences have been observed in schizophrenic patients possessing less than 12 years of education (Davis and Jones 1974), these differences tend to disappear when schizophrenics with 12 or more years of education are compared (Davis, Beck, and Ryan 1973; Davis and Jones 1974; Davis 1975).

Cowan, Watkins, and Davis (1975) attempted to classify black and white schizophrenics and nonschizophrenics, dichotomized into two levels of education ($\geq$ 12 years vs. $<$ 12 years) by means of two MMPI-derived rules: $Sc > 70$; $Sc > Pt$. These rules were found capable of classifying subjects beyond a chance level in all cells except for the low-education blacks. Cowen, Watkins, and Davis (1975) explained these results as reflecting an enculturating effect of education on the MMPI response patterns of minority subjects. The results of this set of studies indicate that educational level should be considered when investigating the effects of race on the MMPI.

Marital status. Lacks, Rothenberg, and Unger (1970) administered the MMPI to 89 male inpatient schizophrenics. They divided their sample into three marital groups—single, married, divorced—and ran a series of *t* tests to evaluate differences on the standard clinical scales of the MMPI. Out of a total of 30 *t* tests calculated, only two achieved statistical significance; i.e., divorced schizophrenics achieved higher *Pd* scores than married patients and married schizophrenics earned higher *Ma* scores relative to single patients. If the .05 level of significance is used, these results could have been expected by chance in light of the number of separate analyses computed.

Religion. Groesch and Davis (1977) performed a canonical analysis of the MMPI responses of Protestant and Catholic schizophrenics and drug abusers ($n = 18$ per cell). The canonical correlation coefficient achieved was .705, which indicates that 49 percent of the variance among the MMPI scales can be accounted for by the independent variables (i.e., diagnosis, religion, age, and education). The canonical variate coefficients for diagnosis and religion were $-.61$ and $+.36$, respectively. The implications of this study are uncertain. Further research

is necessary to determine whether religious affiliation is an important moderator variable in schizophrenic patients.

Comment. Data indicate that some of the patterns and relationships reported in earlier sections of this review may not be applicable to elderly, female, or poorly educated black schizophrenics. However, research in this area could benefit from several changes in methodology, the most important being the manner in which various groups are compared on the moderator variable. Comparing groups simply in terms of mean MMPI scores is objectionable for several reasons: (1) multiple comparisons without any statistical correction can lead to an inflation of the type I error rate; (2) there may be large differences in the slope of the regression line for each comparison group (Pritchard and Rosenblatt 1980); (3) there is a lack of specificity, since factors like education and psychopathology cannot be ruled out (Pritchard and Rosenblatt 1980); (4) statistically significant mean differences are not necessarily clinically relevant. Pritchard and Rosenblatt (1980) recommended the "accuracy test" in which the accuracy of behavioral predictions made by the MMPI are evaluated for each comparison group separately. This approach is illustrated in the study of Cowan, Watkins, and Davis (1975) in which diagnostic decisions were made for black and white patients of both high and low education and then compared.

Measuring and Predicting Response to Treatment. There are several ways in which to organize research on the MMPI in the treatment of schizophrenia. One approach is to separate subjects into groups of improvers and nonimprovers and then analyze pre-post differences on the MMPI. This approach is exemplified in a study by May (1968). May witnessed greater reductions on MMPI scales *F*, *Pa*, *Pt*, and *Sc* in schizophrenic patients who responded to a variety of treatments (e.g., chemotherapy and group psychotherapy) relative to schizophrenics judged not to have benefited from treatment.

A second approach to research on treatment-related changes on the MMPI involves comparing one or more treatment conditions with a control group. Since it is unethical to deny necessary treatment to patients, researchers have tried to equate treatment and control subjects on all variables (e.g., hospitalization, therapeutic milieu, and chemotherapy) except for those specific to the intervention under investigation (e.g., group therapy and chlorpromazine). For instance, to control for the nonspecific features of group therapy, Roback (1972) designed a placebo control group in which subjects observed various films irrelevant to the variables under investigation. In this study Roback failed to find any significant group differences on the MMPI.

Typically, the MMPI has been only one of several outcome measures administered in studies dealing with the treatment of schizophrenics. Therefore, another approach to research in this area involves comparing the relative sensitivity of the MMPI and various other outcome measures to the effects of treatment. The majority of these "other" outcome measures are behavioral rating scales like the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962) and the Inpatient Multidimensional Psychiatric Scale (IMPS; Lorr et al. 1962). In comparing these measures, the results have been mixed, with studies variously indicating that compared to these "other" measures, the MMPI is less sensitive (Mendelsohn, Penman, and Schiele 1959; Luckey and Schiele 1967; Michaux et al. 1972), equally sensitive (Schiele, Janecek, and Zimmermann 1969; Murillo and Exner 1973), or equally insensitive (Sines, Silver, and Lucero 1961; Roback 1972; Sehdev and Olson 1974) to the effects of treatment.

In assessing the issue of multiple measures of treatment response, one may want to consider Campbell and Fiske's (1959) notion of method variance. That is, methods purporting to measure the same construct (e.g., *Sc* Scale and "hallucinations" of BPRS) should correlate more highly with one another than they do with a measure of a different construct (a depression scale, for instance). Thus, while two measures of schizophrenia or response to treatment should correlate more highly with each other than either does with a measure of depression, a perfect correlation is rare due to error variance and variations in methodology. Research is necessary to address this issue with schizophrenics, possibly with the help of the multitrait-multimethod approach (Campbell and Fiske 1959).

Using the MMPI to detect treatment effects (i.e., using the MMPI as a dependent measure) has not been very productive. This, however, does not rule out use of the MMPI as a predictor of response to treatment (i.e., using the MMPI as an independent measure). Thus, it may be more appropriate to use the MMPI as a means of determining which form of treatment is most likely to benefit which type of patient.

Several researchers have attempted to predict the length of hospitalization using the MMPI. McKeever, May, and Tuma (1965) reported that the *Pa* scale was negatively corre-

lated with length of hospitalization in male schizophrenics, while the *Mf* scale was negatively correlated with length of hospital stay in female schizophrenics. In an attempt to predict length of hospitalization, Watson (1968) developed several multiple regression equations from various combinations of MMPI scales with very little success. Although 60 subjects were employed in the design, replication revealed the formulae to be of little use in predicting length of hospital stay.

More recently, Glosz and Grant (1981) found that a stepwise multiple regression procedure involving several MMPI scales and three non-MMPI variables (previous admissions, education, and social adjustment) accurately predicted length of hospital stay ($R^2 = .44$). MMPI scales *D* and *Sc* demonstrated the strongest relationships with length of hospital stay. The *Sc* scale exhibited a positive correlation with the dependent measure, whereas high scores on *D* were prognostic of shorter hospital stays. This suggests that good prognosis, as measured by length of hospital stay, is positively correlated with less disturbed MMPIs and moderate levels of depression.

Comment. Studies investigating the MMPI's ability as an independent variable have met with greater success than those studies examining the MMPI's potential as a dependent measure or estimate of response to treatment. That is, schizophrenics possessing certain MMPI characteristics (i.e., moderate elevations on *D*, lower scores on *Sc*) tend to display shorter hospital stays. It should be noted, however, that this relationship is relatively weak. Furthermore, there is a need to consider more than just length of hospitalization in measuring outcome. For instance, Strauss and Carpenter (1972) have developed a total outcome score based on four areas of outcome dysfunction (symptom severity, social contacts, employment, and duration of hospitalization) which seem to operate as an "open system." Using this type of an approach in measuring outcome would most certainly enhance MMPI research on schizophrenia. In addition, research comparing patient response to several different treatment modalities, as was done by McKeever, May, and Tuma (1965), may help answer the question "as measured by the MMPI, which type of treatment is most likely to benefit which type of schizophrenic?"

Schizotaxia. Meehl (1962), in his genetic/interactional theory of schizophrenia, hypothesized that a neural integrative defect, which he termed schizotaxia (also known as the schizoid-taxon), is the inherited basis for schizophrenia. Certain social learning experiences then interact with this schizotaxic foundation to form a personality structure referred to as schizotypy. Under environmental stress the schizotype is likely to decompensate into schizophrenia. Therefore, while Meehl believes all schizophrenics have a schizotaxic foundation, not all schizotaxic individuals manifest schizophrenic symptoms. The issue addressed in this section is whether the MMPI can aid in the detection and understanding of schizotaxia and schizotypy.

The high-point code felt by many to be significantly associated with the schizotypal personality is a triad involving scales *2* (*D*), *7* (*Pt*), and *8* (*Sc*) (Gilberstadt and Duker 1965; Koh, Kayton, and Berry 1973; Marks, Seeman, and Haller 1974; Golden and Meehl 1979). Fine (1973) reported that a group of college students possessing the *2-7-8* triad exhibited characteristics similar to the behaviors of hospitalized schizophrenics. The presence of a cognitive/perceptual deficit has also been documented in individuals achieving the *2-7-8* triad. More specifically, research reveals the presence of a deficit in the iconic storage of visual material (Steronko and Woods 1978), impaired short-term memory and encoding (Koh, Kayton, and Berry 1973; Koh and Peterson 1974), and disturbances in the ability to access information from long-term memory (Schulman 1976) in subjects with the *2-7-8* profile. This series of deficits, all involving aspects of memory, may lead to the development of delusions and other cognitive disturbances frequently encountered in schizophrenia. However, with the exception of the study of Koh, Kayton, and Berry, this research has been conducted on undergraduate psychology students. Therefore, one needs to be cautious in generalizing the results of these analogue studies to patient populations since the correlations between MMPI scales (and most probably their relationship to other variables as well) can vary on the basis of the types of subjects employed (see Dahlstrom, Welsh, and Dahlstrom 1975).

Golden and Meehl (1979) proposed a method of identifying schizoid-taxon members using the MMPI. They uncovered seven MMPI items which significantly differentiated between 96 diagnosed schizophrenics and the MMPI normative sample, did not correlate with decompensation related variables (e.g., severity of illness), and did not discriminate between subgroups of schizophrenia. They labeled this group of items the Schizoidia scale. In addition, Golden and Meehl reported that the sum of MMPI scales *D*, *Pt*, *Sc*, and *Si* was an accurate estimate of the schizoid-taxon. Studies investigating the

validity of the Golden-Meehl Schizoidia scale have produced generally negative results. For example, Miller, Steiner, and Kahgee (1982) found a cutting score of 4 on the Schizoidia scale identified 53.1 percent of a group of active schizophrenics as taxon members, but also incorrectly classified 70.9 percent of a group of acutely depressed patients into the schizoid-taxon. Chapman, Chapman, and Miller (1982) observed that the Schizoidia scale seems to be measuring the same pathology as the MMPI *2-7-8* and *2-7-8-0* scales, but much less efficiently and reliably. While Miller, Steiner, and Kahgee (1982) found the *2-7-8-0* scale to be unreliable in assigning patients into the schizoid-taxon, Chapman, Chapman, and Miller (1982) found it helpful in measuring proneness to psychosis. It should be noted, however, that Chapman, Chapman, and Miller employed undergraduate students as subjects in their study; the limitations inherent in such analogue comparisons, as previously discussed, need to be kept in mind when evaluating the results of this study.

Another research trend in genetic research on schizophrenia is to study individuals hypothesized to be vulnerable to the development of schizophrenia, but who are not currently manifesting the clinical symptoms of a thought disorder. For instance, Gottesman and Shields (1972) compared monozygotic (MZ) and dizygotic (DZ) twins of consensus schizophrenics on the MMPI (based on the assumption that the MZ twins would have a greater genetic predisposition to schizotaxia). Although the MZ co-twins achieved less elevated profiles relative to consensus MZ schizophrenics, the shape of the configuration was very similar in the two cases, with co-twins achieving a peak on scale *8* (the consensus MZ schizophrenics attained an *8-7* group profile). However, when all co-twins with a diagnosis of schizophrenia were removed, the similarity between the profiles was greatly reduced. The DZ consensus schizophrenics achieved a *2-8* group profile, whereas the DZ co-twins earned profiles which were essentially within normal limits. In comparing the MZ and DZ co-twins, it was discovered that the MZ co-twins scored significantly higher on *Pa*, *Pt*, and *Sc*. Nevertheless, these differences disappeared once consensus schizophrenics were removed from the two co-twin groups. Thus, while decompensated schizotypes were easily detected by means of the MMPI, compensated schizotypes, who did not display any of the clinical features of schizophrenia, were not.

Haier, Rosenthal, and Wender (1978) took another approach to the study of genetic influences in schizophrenia by comparing the MMPI response patterns of 64 adopted-away offspring of schizophrenics and 64 matched controls. The index and control groups were found not to differ in terms of the total percentage of elevated MMPI profiles (i.e., four or more clinical scales ≥ 70). However, by using a combination of MMPI criteria and interview-based diagnoses, they identified significantly more of the index (22 percent) than control (6 percent) cases as falling within the schizophrenic spectrum. While the results of this study suggest that the MMPI may be useful in investigating the genetic bases of schizophrenia, the data are not terribly convincing. This does not mean, however, that the MMPI is useless in studying this issue because many aspects of the entire research perspective in this area (take the schizophrenic spectrum as an example) are still widely debated.

Comment. Research has tended not to support the efficacy of the MMPI in identifying schizotaxia or schizotypy. While it appears quite capable of detecting individuals who are exhibiting clinically significant schizophrenic symptomatology, it has generally been found to be insensitive to compensated forms of schizotypal personality organization and individuals hypothesized to be at risk for schizophrenia (i.e., MZ co-twins of consensus schizophrenics; offspring of schizophrenics). However, the research in this area suffers from a number of methodological limitations. For instance, decompensated schizotypes (as used by Miller, Steiner, and Kahgee 1982) may not respond to the MMPI in the same manner as do compensated schizotypes. Therefore, individuals at risk (e.g., significant family history of schizophrenia) but not currently manifesting schizophrenic symptoms should be studied, not actively schizophrenic patients. Second, followup of subjects over a period of time is necessary to validate an impression of schizotypy and rule out this impression in control subjects. Designs which include a 2-3 year followup of patients thought to be schizotypal or at risk for the development of schizophrenia would certainly do much to advance this area of research. In the afterword of Gottesman and Shields' (1972) book, Paul Meehl concludes that the *Sc* scale is insensitive to compensated schizotypy and remarks that this scale should be broken down and a subset of items selected which is relevant to nonclinical forms of schizophrenia. While the scale that seems to have been stimulated by this suggestion (i.e., the Schizoidia scale) has met with limited empirical support, better designed research is needed to evaluate its potential utility.

Linear Versus Configural Rules of MMPI Classification. An issue intrinsic to MMPI research on schizophrenic classification rules involves configural versus linear scale combinations. Configural rules focus on the relationships between scales (e.g., *Pt* > *Sc*), whereas linear rules simply combine the scores of various MMPI scales (e.g., *D* + *Hs* − *Sc*). The total score on a configural scale is the number of relational rules satisfied, while the total score on a linear scale is the sum total of all MMPI scales considered. A debate has raged over the past two decades concerning which approach is more effective in discriminating between neurotic and psychotic patients (Meehl 1959; Goldberg 1965).

Linear and configural approaches have been directly compared in several investigations. Goldberg (1965) discovered that a simple linear combination of five MMPI scales (*L* + *Pa* + *Sc* − *Hy* − *Pt*) outperformed a number of established configural approaches (i.e., Meehl/Dahlstrom, Peterson, Taulbee/Sisson) in discriminating between neurotic and psychotic patients. Giannetti et al. (1978) compared the Goldberg index and two configural systems, the Meehl/Dahlstrom rules and Taulbee/Sisson signs, and noted that only the Goldberg index performed better than chance. In discriminating between schizophrenics and brain-damaged individuals, the Watson-Thomas rule that has consistently produced the best results is rule 4, the linear rule (Watson and Thomas 1968). These results tend to support Goldberg's (1965, 1969) contention that linear approaches are superior to the more complex configural methods in assigning patients to gross diagnostic categories.

In one study, Goodson and King (1976) observed that a configural model (Peterson) significantly outperformed a linear model (Goldberg) and concluded that the Goldberg index is of questionable utility. This conclusion is objectionable for two reasons. First, the percentage of correct classifications achieved when only the neurotic and psychotic profiles are considered (69 percent) was adequate given the performance of other MMPI scales and indices. Second, Goodson and King failed to employ a test-independent criterion (i.e., they employed clinical interpretation of the MMPI by expert judges). It could even be argued that the Goldberg index correctly identified neurotics and psychotics which were undetected by the clinicians and, as a result, was unjustly penalized. This hypothesis is supported by the fact that the index correctly classified 100 percent of the neurotic and psychotic profiles when the criterion diagnoses were determined independent of the MMPI (Goodson and King 1976).

While further research is necessary, a linear model appears to be as effective, if not more effective, relative to a configural approach. This finding, coupled with the fact that a linear model has certain inherent advantages (less complex, can be applied to smaller samples), suggests that a linear approach is probably the model of choice in a majority of clinical situations, at least where the MMPI is involved. The development of a linear MMPI equation designed specifically to identify schizophrenia would seem to be a worthwhile research venture.

Multiple Variable Input. Combining the MMPI with other measures for the purpose of maximizing diagnostic discrimination is an emerging research trend. In a series of studies, Watson and his colleagues (Watson 1973; Watson and Plemel 1978; Watson et al. 1981) have found bivariate combinations of ability and MMPI measures superior to either predictor alone in discriminating between organic and schizophrenic patients. In the Watson et al. (1981) study, it was noted that combined use of the *P–O* scale (Watson and Plemel 1978) and Smith Symbol Digit Modalities Test (SDMT) achieved better results than either measure achieved by itself. Other researchers have employed various diagnostic and prognostic criteria relevant to schizophrenia (e.g., Schaefer 1973; Glosz and Grant 1981). This approach needs to be continued and the trend expanded in order to encompass a variety of different predictors (e.g., MMPI, ability measures, Rorschach, symptom patterns).

In a study previously reviewed, Walters (1982) performed a series of stepwise discriminant function analyses involving demographic, behavioral, and MMPI information. In contrasting schizophrenic and affectively disturbed patients, he discovered a combination of MMPI (high-point pair including scale *8*, *Sc*), demographic (single-nonsingle, previous psychiatric hospitalizations), and behavioral (poor judgment, hyperactivity, depression) data which produced a squared canonical correlation of .511. Schizophreniform and affectively disturbed patients were contrasted at an even slightly higher level (R^2 = .588). The squared canonical correlation for the schizophrenic-schizophreniform comparison, on the other hand, while statistically significant, was noticeably lower in comparison to the previous two figures. Walters speculated that schizophrenia and schizophreniform disorders are much more similar to each other than either is to primary affective disorder.

Haier, Rosenthal, and Wender (1978) observed that when MMPI

data and interview-based diagnoses were combined, the ability to discriminate between adopted-away offspring of schizophrenics and control subjects was enhanced. Therefore, behavioral data and MMPI scores may be complementary, rather than antagonistic, generating significantly more information than either predictor could by itself. It is not unreasonable to hypothesize that the MMPI has the potential to contribute important information to several of the diagnostic schemes reviewed in the first section. For example, including *Pa* and *Sc* scores in the RDC or Flexible system may enhance their predictive power. This question, however, can only be answered through continued research.

Conclusions

This completes our survey of research pertaining to use of the MMPI with schizophrenic patients. One should keep in mind that the MMPI scales and indices reviewed here need to be viewed as quick, inexpensive screening devices, some of which are capable of distinguishing between gross diagnostic categories at a relatively high rate of accuracy. However, they may not be totally appropriate in situations where a reasonable degree of specificity is required. For instance, a psychologist working at a community mental health center who wishes to rule out a diagnosis of schizophrenia in an individual patient may do well to employ a battery containing psychological (WAIS-R, MMPI, Rorschach) as well as nonpsychological (SADS, BPRS, "Flexible" system) measures, rather than to rely solely upon the *Sc* scale or Newmark rules. On the other hand, the *Sc* scale or Newmark rules may be more feasible, and certainly less expensive, than the full battery as a general screening measure. Thus, the MMPI should be viewed as providing the clinician with probabilistic statements which can then be explored further by more specific methods; to use the MMPI or any of its special scales as the sole basis for making a major decision about a patient is not only unwise, but also unethical.

While this review supports the contention that it is unwise to rely solely on information provided by the *Sc* scale in predicting schizophrenia, it also highlights the central role played by this scale in the diagnosis of schizophrenia. Inspection of all major MMPI indices and formulae used to detect schizophrenia, as well as the high-point pairs associated with this disorder, reveals the prominence of *Sc* in each. Moreover, research suggests that the *Sc* scale frequently performs as well as most special scales and indices in the identification of schizophrenic patients (Ayers, Templer, and Ruff 1975). Thus, the importance of the *Sc* scale in the schizophrenic syndrome should not be underestimated.

As has been clear throughout this review, a variety of conceptual and methodological limitations make it difficult to draw firm conclusions. This is not to suggest, however, that no conclusions can be offered. For instance, there is support for the value of the MMPI in diagnostic decision-making, particularly when it is combined with other information. Combining MMPI and non-MMPI data, be it psychometric, behavioral, or demographic, is likely to produce the most fruitful results and is preferable to an isolated focus upon MMPI data alone. The observation that the MMPI may be more applicable to narrow band, as opposed to wide band, diagnostic schemes like *DSM-III* and the RDC is encouraging (cf. Haier et al. 1979; Johnson, Klingler, and Giannetti 1980). Comparing the diagnostic accuracy of the MMPI in a system professing a narrow definition of schizophrenia (e.g., RDC, *DSM-III*) with one holding to a more wide band perspective (e.g., New Haven Schizophrenia Index, *DSM-II*) would be highly informative. While several other areas of MMPI research on schizophrenia have met with largely negative findings (i.e., genetic basis of schizophrenia; predicting response to treatment), better designed research is necessary to evaluate the MMPI's clinical and research utility in these areas.

Despite over 100 MMPI research studies on schizophrenia, it is somewhat surprising, although revealing, that little is known about the MMPI correlates of schizophrenia. A major obstacle for researchers in this area has been a general lack of organization and direction. "Quick and easy" studies have too often been a substitute for well-planned, executed, and analyzed research projects. This lack of theoretical structure has resulted in significant levels of confusion and disarray. The results of the current review suggest that MMPI research designed to discriminate between schizophrenic and nonschizophrenic patients seems to have reached a point at which new studies are not providing much new information. As a result, there is a need for research in this area to assume new directions. One possibility is for additional and more sophisticated research concerning the use of multiple variable input in predicting schizophrenia.

A second potential research trend in this area could involve classification of schizophrenics into subgroups on the basis of their MMPI profiles. Cluster analysis is a statistical procedure which seems well adapted to

this type of task. Of course, it would be necessary to cross-validate these subgroups in a relatively large sample of schizophrenics and determine the empirical correlates of each subtype (i.e., behavior, long-term prognosis, response to treatment).

The MMPI may also have utility beyond simply measuring psychopathology. For instance, Haier et al. (1979) used the MMPI to identify psychopathology in "normal" college students; why not use the MMPI to identify health in schizophrenics? More specifically, do diagnosed schizophrenics who fail to show MMPI elevations differ from schizophrenics who do show MMPI elevations in their behavior, coping abilities, and response to treatment, after these groups have been equated on such variables as age, education, and chronicity of disturbance (see Greene 1980)?

A theoretical approach that may serve as a useful framework for future MMPI research on schizophrenia is the positive symptom-negative symptom approach to schizophrenic diagnosis advocated by Andreasen (1982). It is hypothesized that positive symptoms, such as delusions and hallucinations, involve a release of cortical inhibition, and tend to remit with treatment. Andreasen maintains that negative symptoms (anhedonia, alogia, avolition/apathy, affective flattening, and attentional impairment) are even more important in establishing a diagnosis of schizophrenia. Negative symptoms are thought to involve a loss of function through damage to some area of the brain and tend to have long-term, debilitating effects (Andreasen 1982). The MMPI may conform nicely to this theoretical scheme, particularly if one considers the Harris-Lingoes (1955) subscales for scale 8 (*Sc*). For instance, Sc_{1B} (emotional alienation) and Sc_{2B} (lack of ego mastery, conative) seem to have a strong negative symptom influence, whereas Sc_{2A} (lack of ego mastery, cognitive), Sc_{2C} (lack of ego mastery, defective inhibition), and Sc_3 (bizarre sensory experiences) have more of a positive symptom flavor. Use of the positive symptom-negative symptom scheme, be it through use of the Harris-Lingoes subscales or some other MMPI measure, may provide the theoretical structure and guidance so sorely needed in this area of research.

A variety of methodological strategies—use of multiple outcome measures; followup evaluations; supplementing univariate comparisons with multivariate procedures—and new research trends—using the MMPI to differentiate between subgroups of schizophrenics; determining whether "schizophrenic" scales and indices add significant information to that provided by the standard MMPI scales—are recommended. Research designs need to be more sophisticated and address more clinically relevant issues. For example, it may be informative to have an individual familiar with the behavior of a particular patient (e.g., therapist, relative) evaluate and compare two behavioral narratives, one based solely on demographic/background information and the other based on both demographic/background information and MMPI data. Since this design more closely approximates the "typical" clinical situation, it may help determine whether the MMPI provides useful clinical information in an idiopathic sense. This review suggests that the MMPI has the potential to enhance our understanding of the schizophrenic individual. However, there needs to be a change in research emphasis and the development of new research trends before this potential can be realized.

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