RELATIVE EFFICACY OF THE Sc-O, P-O, P-N, and Sc MMPI SCALES IN DIFFERENTIATING BRAIN-DAMAGED, BRAIN-DAMAGED SCHIZOPHRENIC, SCHIZOPHRENIC, AND SOMATOFORM DISORDERS IN AN OUTPATIENT SETTING

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This study examined the efficacy of the Schizophrenic-Organicity (Sc-O), Psychiatric-Organic (P-O), the Pseudo-Neurological (P-N), and the Schizophrenia (Sc) MMPI subscales in differentiating the following four groups of outpatients: brain-damaged (n = 35), brain-damaged schizophrenics (n = 10), non-brain-damaged schizophrenics (n = 15), and somatoform disorders (n = 45). Both unmatched and matched samples were used in the analysis, and cut-off scores were obtained. In an unmatched sample, results suggested that the Sc scale was useful in differentiating brain-damaged schizophrenics from brain-damaged and somatoform disorders. With matched samples, the Sc differentiated brain-damaged schizophrenics well from other clinical groups, while the P-O scale differentiated the non-brain-damaged schizophrenics from brain-damaged and somatoform disorders. Furthermore, the P-N scale discriminated brain-damaged schizophrenics from non-brain-damaged schizophrenics, while the Sc-O scale was no longer significant. Results suggest that caution should be used in generalizing from previous studies (which used inpatient samples) to outpatient populations.

Studies that have used the MMPI to differentially diagnose brain damage from psychiatric conditions have been of major interest to clinical psychologists. Generally, these studies have attempted to use the MMPI to differentiate between neurological and psychiatric subjects who at first present with neurological complaints (Mack, 1979). The majority of the studies have utilized special MMPI scales developed for specific purposes. MMPI studies of brain-damaged patients generally have taken two approaches (Mack, 1979). In the first approach, the neurological conditions (e.g., multiple sclerosis) have been the independent variables and the MMPI a dependent variable. In the second approach, the MMPI has been used in the differential diagnosis of brain damage vs. psychiatric conditions.

Three of the MMPI special scales have demonstrated particular value in both of these instances. The special scales are the Schizophrenia-Organicity (Sc-O) scale (Watson, 1971), the Psychiatric-Organic (P-O) scale (Watson & Plemel, 1978), the Pseudo-Neurological (P-N) scale (Shaw & Matthews, 1965). The Sc-O scale was developed to differentiate organic from schizophrenic patients and has proved successful in 10 cross-validation studies (Watson, 1984). By contrast, the P-O scale was developed to separate

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organics from all types of functional disorders (e.g., schizophrenia, alcoholism, and neurosis). Horton and Wilson (1982) successfully cross-validated this scale. The P-N scale was developed to differentiate patients who presented with neurological complaints, but did not have brain damage from those who also presented with neurological complaints and had verifiable brain damage. Two studies (Dodge & Kolstoe, 1971; Schwartz & Brown, 1973) successfully cross-validated the P-N Scale.

Golden, Sweet, and Osmon (1979), Sillitti (1982), and Graca, Hutzell, Gaffney, and Whiddon (1984) have examined these three scales in the task of differentiating brain-damaged from schizophrenic groups of inpatients. While some of these studies (Golden et al., 1979, Sillitti, 1982) demonstrated a role for the Schizophrenia (Sc) scale of the MMPI (Hathaway, 1956) in differentiating schizophrenic and brain-damaged groups, these same studies were faulted by Watson (1984) on numerous methodological grounds.

The present study attempted to address the efficacy of these MMPI scales in the differential diagnosis of brain damage and psychiatric conditions from the viewpoint of studying outpatients instead of inpatients and also adding several methodological refinements. The rationale for replicating earlier findings with inpatient populations was that to date no study has attempted to validate the use of these scales with outpatients, which has limited the generalizability of prior results. In addition to the traditional groups of schizophrenic and brain-damaged patients, groups of brain-damaged schizophrenics and somatoform patients were included. Because schizophrenia is no defense against head trauma or stroke or many other neurological conditions, the inclusion of the brain-damaged schizophrenic group was seen as most important to a crucial test of the MMPI Scales. Similarly, the somatoform group was seen as crucial to the proper evaluation of the P-N Scale. Furthermore, these types of patients often are grouped by referral sources with true CNS damage cases and, thus, comprise a representative segment of health/neuropsychological outpatient practice. It was anticipated that the P-N Scale would be useful in differentiating somatoform from the brain-damaged groups, that the P-O Scale would differentiate organic from the schizophrenic (and possibly somatoform) patients, that the Sc-O would differentiate the schizophrenic from the organic subjects, and that the Sc would differentiate the two schizophrenic from the two nonschizophrenic groups. Somatoform disorders were selected instead of other groups or a combination of functional diagnostic groups because the question of organic vs. functional diagnosis most often involved a differential diagnosis in which somatoform disorders are one of the most likely possibilities.

Study 1

Subjects and Procedure

Four groups of subjects were obtained from 105 clinical outpatients in a private practice setting. Each had been administered Form R of the MMPI as part of initial interview and testing sessions. The MMPI was taken individually in an isolated interview room or read to subject when client (n = 2) had inadequate vision. Only valid MMPI profiles were accepted; the F, K, and F-K dissimulation index were used as indicators of validity for the study (Puente, 1987). All subjects had no less than an eighth-grade education.

The four groups were composed of 45 somatoform patients, 35 brain-damaged clients, 15 non-brain-damaged schizophrenics, and 10 brain-damaged schizophrenics. Brain damage was confirmed by laboratory tests (e.g., EEG, CAT scan), interpreted by a board-certified neurologist with type of damage found in Table 1. DSM-III

(American Psychiatric Association, 1980) diagnosis of schizophrenia and somatoform disorder was ascertained by a licensed doctoral-level psychologist, who used history, interview, and non-MMPI testing (e.g., Whitaker Index of Schizophrenic Thinking). All schizophrenics were diagnosed as chronic undifferentiated type. When any evidence pointed to the possibility of neurological symptoms, but unequivocal evidence was not possible, the profile was excluded. However, unequivocal laboratory test results had to be present for a case to be placed in the brain-damaged group. Somatoform disorders were referred for psychological evaluation by a board-certified neurosurgeon and/or neurologist. Demographic information is found in Table 2.

Table 1
Subclassification of Participants According to Clinical Groups

Schizophrenic (n = 15)	Brain-damaged schizophrenic (n = 10)	Brain-damaged (n = 35)	Somatoform (n = 45)
Schizophrenic = 15	Schizophrenic., chronic undifferentiated = 10	Head trauma = 15 Stroke = 9 Alcohol = 6 Seizures = 5	Pain = 15 Cardiovascular = 12 Mixed = 14 Gastrointestinal = 4
	Brain damage Head trauma = 5 Stroke = 1 Seizures = 1 Degenerative = 1 Alcohol = 1 Metabolic = 1		

Table 2
Means and Standard Deviations for Demographic Variables for the Four Clinical Groups in Study 1

Group	Age	Sex	Race	Education
Schizophrenic	38.6	M = 8	W = 12	12.6
	(11.06)	F = 7	B = 3	(1.9)
Brain-damaged schizophrenic	38.5	M = 8	W = 9	11.1
	(8.67)	F = 2	B = 1	(1.4)
Brain-damaged	46.6	M = 18	W = 26	11.9
	(12.14)	F = 17	B = 9	(1.9)
Somatoform	46.07	M = 19	W = 38	11.6
	(11.25)	F = 26	B = 6	(1.5)

ANOVAs revealed significant age differences (F[3, 101] = 2.89), but not educational (F[3, 101] = 1.60) differences. Tukey's analyses indicated no significant differences among groups on the age variable. Chi square analysis on race and sex did not indicate significant group differences.

Results

Means for each of the MMPI subscales across clinical groups are found in Table 3. Four one-way, four-level analyses of variance (ANOVA) compared the four groups on each clinical scale. Significant group differences, at $p < .01$, were seen for the P-O ($F[3, 101] = 6.2$), Sc (8) ($F[3, 101] = 4.6$) scales. Tukey's test revealed that non-brain-damaged schizophrenics differed from the brain-damaged schizophrenics on the Sc scale at $p < .01$, from brain-damaged on the P-O scale at $p < .01$ and Sc-O scale at $p < .05$, and from somatoform disorders on the P-O scale at $p < .01$ and Sc-O scale at $p < .05$. Brain-damaged schizophrenics differed from brain-damaged on the Sc scale at $p < .05$ and from somatoform disorders on the Sc scale at $p < .01$. In summary, the unmatched sample analyses revealed that the Sc scale was useful in differentiating brain-damaged schizophrenic from other clinical groups. The P-O and Sc-O scales appeared useful in differentiating non-brain-damaged schizophrenics from brain-damaged and somatoform disorders. Cut-off scores were calculated for all statistically significant scale comparisons in order to maximize correct hit rates. For the P-O scale, a cut-off of ≥ 23 correctly classified 73% of schizophrenics and incorrectly classified 22% somatoform and 26% of the brain-damaged subjects as psychiatric patients. For the Sc-O scale, a cut-off of ≥ 46 correctly classified 67% of schizophrenics and incorrectly classified 20% of somatoform disorders and 31% of brain-damaged individuals as schizophrenic. Two sets of cut-off scores were obtained for the Sc scale because two major clinical compositions emerged as statistically significant with post-hoc testing. When a cut-off of ≥ 42 was used, schizophrenics were classified correctly as schizophrenic 20% of the time. When a cut-off of ≤ 40 was used, 80% of brain-damaged schizophrenics were classified correctly, while 33% of brain-damaged patients and 13% of somatoform disorders were classified incorrectly as brain-damaged schizophrenic.

Table 3
Means for Special Scales for the Four Clinical Groups for Unmatched and Matched Samples

Groups		Scales			
		PN	PO	Sc-O	Sc
Schizophrenic	Umatched	10.6	25.0	53.0	41.9
	Matched	6.1	18.3	44.9	25.9
Brain-damaged Schizophrenic	Umatched	8.0	19.9	41.9	29.0
	Matched	11.2	25.7	54.0	42.1
Brain-damaged	Umatched	9.9	29.5	58.1	25.6
	Matched	7.8	30.0	65.6	21.5
Somatoform	Umatched	9.0	26.4	60.9	28.0
	Matched	9.9	33.1	60.0	22.8

Study 2

In the previous set of analyses, subjects were included according to diagnostic category with no regard for demographic variables. ANOVAs on the demographic data revealed significant age differences that could have affected the findings. To address this potential confound, a new set of analyses were completed on matched samples.

Method

Four matched groups (n = 10 per group) were obtained from the four groups in Study 1. The groups were derived by matching for the demographic variables of age, gender, race, and education. Table 4 contains the demographic data for Study 2. ANOVAs did not reveal significant education or age differences.

Table 4
Mean and Standard Deviation for Demographic Variables for the Four Clinical Groups in Study 2

Groups	Age	Gender	Race	Education
Schizophrenic	37.3	M = 8	W = 9	13.0
	(10.9)	F = 2	B = 1	(2.2)
Brain-damaged schizoprenic	38.8	M = 8	W = 9	11.1
	(8.6)	F = 2	B = 1	(1.4)
Brain-damaged	41.5	M = 8	W = 9	12.4
	(11.3)	F = 2	B = 1	(1.6)
Somatoform	41.1	M = 8	W = 9	11.5
	(8.46)	F = 2	B = 1	(1.27)

Results

Means and standard deviations of the MMPI scales for the matched-sample clinical groups are found in Table 3. The one-way ANOVAs revealed significant group differences for three of the four MMPI scales, $F(3, 36) = 3.5$, $p < .025$ for P-N, $F(3, 36) = 6.7$, $p < .01$ for P-O, and $F(3, 36) = 4.7$, $p < .01$ for the Sc scales. Tukey's tests revealed that non-brain-damaged schizophrenics differed from brain-damaged and somatoform subjects on the P-O scale at $p < .01$. Brain-damaged schizophrenics differed from brain-damaged ($p < .01$) and somatoform subjects ($p < .05$) on the Sc scale. Thus, the Sc scale differentiated brain-damaged schizophrenics well from other clinical groups, while the P-O scale differentiated the non-brain-damaged schizophrenics from brain-damaged and somatoform disorders. In this matched sample analysis, the P-N scale was an aid in discriminating brain-damaged schizophrenics from non-brain-damaged schizophrenics, while the Sc-O scale was no longer significant in differentiating among groups.

Discussion

The findings of this study suggest that caution is necessary in applying these MMPI scales to outpatient brain-damaged, schizophrenic, somatoform, and brain-damaged schizophrenics. As was noted earlier, previous studies (Golden et al., 1979; Graca et al., 1984; Sillitti, 1982) had only examined inpatient groups of brain-damaged and schizophrenic individuals. Given the different status of these patients, of course, some differences could be expected reasonably. Specifically, these differences are particularly critical because these MMPI special scales are related inversely to psychopathology. Furthermore, such pathology may be limited in outpatients, which would limit the discriminating ability of the scale.

There were a number of interesting differences between this study, which utilized outpatients, and previous studies, which exclusively utilized inpatients. Perhaps the most

surprising difference was the lack of significant differences on the Sc-O scale with the matched group condition. This was noteworthy because the Sc-O scale had been found to be significant in the unmatched condition. As noted by Watson (1984), this scale has been cross-validated more than 10 times in studies with inpatient populations. Similarly, the P-N scale, which had been twice cross-validated (Dodge & Kolstoe, 1971; Schwartz & Brown, 1973), failed to differentiate significantly the somatoform group from the brain-damaged group.

In contrast, the other MMPI scales demonstrated more robust relationships. The P-O scale's success in differentiating the schizophrenic from the brain-damaged groups in both the matched and unmatched conditions suggests that it is the MMPI scale of choice in differentiating schizophrenic and brain-damaged outpatient groups. This finding is consistent with previously cited findings with inpatients that demonstrated the value of the P-O scale for answering this question (Watson, 1984). Similarly, it appears that the Sc scale has particular value when outpatient brain-damaged schizophrenics are to be differentiated from either outpatient brain-damaged subjects or schizophrenics.

In terms of methodological limitations of this study, the following comments are offered. Without question, the sample size in the matched condition was small. Unfortunately, the difficulty encountered in finding well-documented cases of specific subject groups (e.g., brain-damaged schizophrenics) and the need to control for demographic variables necessitated a realistic compromise with clinical reality. Also, we excluded subjects with invalid MMPI profiles. This procedure may have limited the efficacy of some of the scale because in part they appear to work by differentiating subjects with high (usually functional) and low (more often organic) levels of personality disturbance from one another. Therefore, the scales may work better with populations in which invalid MMPI profiles have not been exluded.

Similarly, in an MMPI study of individuals with brain dysfunction, some researchers think that it is advisable to control for the specific types of brain dysfunction conditions, the degree of cognitive impairment, and premorbid personality (Mack, 1979). On the other hand, other workers (Watson & Plemel, 1978) question the values of such controls because these steps lessen the differences between groups and reduce the power of a scale to separate groups. An alternate position is to use confounding with age as a way to improve a scale's discriminating power. Specifically, generalizations from this research are limited to the type of conditions used in this study and to patients in an outpatient status. In addition, there is the question of neurological impairment in schizophrenia (Seidman, 1983). While it is acknowledged freely that neurological involvement may affect certain forms of schizophrenia, the purpose of including brain-damaged and non-brain-damaged schizophrenic groups was to discriminate between schizophrenics who did and did not have documented symptoms of CNS involvement. This was seen as a necessary first step in addressing the issue.

Several possibilities exist for future research. First and foremost, cross-validation of the results of this study with an independent and larger sample of outpatients would be appropriate. For example, this approach would examine the degree of inflation of false positive rates for the selected cut-off scores. Additionally, increasing the number of subjects while maintaining group integrity would increase the statistical power (because our matched sample $n = 10$). Additional nuisance variables (e.g., neuroleptic medication) also could be taken into account in further investigations. Examination of the relationship between the Sc-O scale and a host of demographic variables, particularly age, would be interesting. Similarly, because all previously published successful cross-

validations of the P-N scale used multiple sclerosis groups (Dodge & Kolstoe, 1971; Schwartz & Brown, 1973), it would be important to explore whether the P-N scale is successful only when it is differentiating a multiple sclerosis group from a somatoform group. Finally, it would be appropriate to include both valid and invalid MMPI profiles per the issues discussed earlier.

In summary, this study has demonstrated particular value for the P-O and Sc MMPI scales in differentiating groups of outpatient schizophrenic, brain-damaged schizophrenic, and brain-damaged subjects. However, further research will be necessary to establish the relative efficacy of the Sc-O and P-N MMPI scales with outpatient populations.

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