CLINICAL AND COGNITIVE SEX DIFFERENCES IN SCHIZOPHRENICS

By

Marjorie Saile Fabian

Bachelor of Science
University of Maryland
College Park, Maryland
1976

Master of Arts
University of Florida
Gainesville, Florida
1978

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
July, 1984

CLINICAL AND COGNITIVE SEX DIFFERENCES

IN SCHIZOPHRENICS

Thesis Approved:

Larry Hochhaus
Thesis Adviser

Kenneth D. Sandvold

Donald K. Fromme

Joseph Pearl

Norman N. Durham
Dean of the Graduate College

PREFACE

Clinical symptoms and cognitive functioning were examined in schizophrenic patients as a function of gender. Results were that although schizophrenic women outperformed schizophrenic men in verbal abilities and showed a trend to perform differently in pattern of verbal and spatial performance, they manifested the same level and pattern of deficit relative to normal control women as did schizophrenic men relative to normal control men. Furthermore, schizophrenic women exhibited a lesser degree of psychopathology than schizophrenic men, but the overall profile of clinical symptoms was quite similar. Therefore, conclusions were that schizophrenic etiology may not differ as a function of gender. However, meaningful differences in both clinical symptoms and cognitive performance were found between schizophrenic subtypes (paranoid vs. nonparanoid schizophrenics). Thus, these data suggest that different etiologies and brain abnormalities may underlie these schizophrenic subtypes.

I would like to express my sincere gratitude and appreciation for the many people who assisted me in this work. In particular, I would like to thank my major adviser, Larry Hochhaus, for his helpful guidance and

caring concern. Thanks are due to my other committee members, Don Fromme, Ken Sandvold, and Joe Pearl, for their constructive advice conveyed in such a positive manner during the course of this work.

My good friend, Hal Williams, deserves especially warm thanks for his generous and invaluable help on this study and throughout the years we have known each other. I would also like to express my affection and appreciation for my first mentor, Oz Parsons, who taught me so much about research in such an enjoyable way.

Many people helped me carry out the practical aspects of this study. I could never have done this project so quickly or so well without Randy Sengel's generous guidance and advice. Thanks also go to Laura Klassen who expertly took the reponsibility for testing control subjects off my shoulders. I am very grateful to Andy Cucchiara for always finding the time and having the good will to advise me on statistical and computer matters. My thanks also to the administration, staff, and patients of Central State Hospital, who seemed to go out of their way to help me.

Finally, I would like to thank my parents for their encouragement and support over the years, and my dear husband, Bill, for his scholarly advice and practical help and, most especially, for his love, support, and belief in me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter I

Introduction

Research in schizophrenia has focused on male or mixed-sex groups of subjects. Relatively few investigators have examined female populations or addressed the issue of possible sex differences (Wahl, 1977). Yet the studies reporting male-female comparisons have found sex differences in many areas, including response to neuroleptic treatment (Hogarty, Goldberg, Schooler, & Ulrich, 1974), family-of-origin environment (Fleck, Lidz, & Cornelison, 1963), thought disorder (Becker, 1956; Faibish, Gruber studies as cited in Chapman & Chapman, 1973), epidemiology (see Lewine, 1981), familial transmission (Rosenthal, 1962; 1977), childhood social development (Watt, 1972; 1978), premorbid social competence and process-reactive ratings (Allon, 1971; Kokes, Strauss, & Klorman, 1977; Klorman, Strauss, & Kokes, 1977), and clinical symptomatology (e.g., Cheek, 1964; Gross, 1959; Tsuang, Dempsey, & Rauscher, 1976; World Health Organization, 1973; 1975). Research on the latter topic is sparse and incomplete, and to our knowledge, no systematic studies designed to illuminate sex differences in clinical symptom profiles have been

done. Furthermore, studies in this area are riddled with serious methodological problems, e.g., seven out of eight investigators cited in Lewine's 1981 review of the literature relied on diagnoses from hospital records or used a total psychiatric group rather than a schizophrenic sample. In general, the literature suggests that men tend to evidence a more typical schizophrenic profile, characterized by withdrawal, blunted affect, and decreased motor activity, whereas women are more likely to present an atypical picture of florid, affective, and active symptoms (see Lewine, 1981).

Possible sex differences in the neuropsychological functioning of schizophrenics have also been ignored, although there are good reasons to believe that such differences may exist. In addition to the many differences between male and female schizophrenics mentioned above are the well-documented findings of cognitive sex differences in normal individuals (e.g., Maccoby & Jacklin, 1974; Wittig & Petersen, 1979). Normal men have better spatial skills than women, and women are superior to men in verbal abilities. Furthermore, evidence suggests that functional asymmetry of the brain, i.e., specialization of the right hemisphere for spatial tasks and the left hemisphere for verbal skills, is more pronounced in males than in females (Hannay & Malone, 1976; Harris, 1978; Kail & Siegel, 1978; Witelson, 1976). These sex differences in lateralization may account for

the observed differential effects of CNS disease or trauma in men and women: generally, only men demonstrate marked test-specific laterality effects, i.e., verbal abilities deficient in left-hemisphere damaged subjects and spatial skills impaired in right-hemisphere damaged subjects (Inglis & Lawson, 1981; McGlone, 1978; McGlone & Kertesz, 1973).

Research on the cognitive abilities of schizophrenics is basically of two types. One group of investigators with an atheoretical viewpoint has compared the neuropsychological performance of schizophrenics to that of brain-damaged populations to determine if a schizophrenic population can be discriminated from an organic population. Results from a large number of studies using a variety of instruments have indicated that schizophrenic subtype is important: process schizophrenics perform at the same level as brain-damaged subjects, whereas nonprocess schizophrenics do considerably better, although their performance may also be impaired (Goldstein, 1978; Heaton, Baade, & Johnson, 1978; Lilliston, 1970; Malec, 1978; Seidman, 1983). These neuropsychological inferences of brain dysfunction receive support from neuroanatomical, neurophysiological, and neurological findings of schizophrenic brain pathology (e.g., Abrams & Taylor, 1979; Buchsbaum, 1977; Donnelly, Weinberger, Walkman, & Wyatt, 1980; Rosenthal & Bigelow, 1972; Seidman, 1983; Torrey, 1980); moreover, Seidman

(1983) observed that six studies have reported correlations between computerized tomography abnormalities and neuropsychological dysfunction. A second type of research has attempted to localize schizophrenic deficits based on neuropsychological data. Results in this area have been mixed. A few investigators reported findings that could be interpreted as a right hemisphere dysfunction (Golden, 1976; Gur, 1979; Hartlage & Garber, 1976), many have described diffuse deficits or difficulties with interhemispheric transfer (Beaumont & Dimond, 1973; DeWolfe, Barrell, Becker, & Spaner, 1971; Taylor, Redfield, & Abrams, 1981), and the favored hypothesis is that of schizophrenic left-hemisphere deficit (Flor-Henry, 1976; Gruzelier & Hammond, 1976; Newlin, Carpenter, & Golden, 1981; Piran & Bigler, 1981; Seidman, 1983). However, two review articles of this area have expressed particular concern over methodological issues and interpretations of localization of deficit (Marin & Tucker, 1981; Newlin, Carpenter, & Golden, 1981).

Studies of cognitive deficits in schizophrenics have many flaws in addition to their failure to consider sex as a variable which may limit the validity of the conclusions. Briefly, the more important weaknesses relevant to the present study include diagnostic problems, heterogeneity of schizophrenic populations, inadequate control groups, and noncomparability of test instruments (Chapman & Chapman, 1973). This latter issue is of

particular importance in evaluating different abilities and making interpretations about impairment in those abilities. Deficits in the performance of an experimental group are judged as such relative to the performance of a control group. However, it is difficult to compare various cognitive skills using different types of tasks, as the psychometric properties of the testing instruments may influence the results. For example, subjects may show a deficit on a task assessing one ability simply because it was more difficult or less reliable than the measure used to assess a different skill.

The two cognitive tasks employed in the present study have verbal and spatial components which were equated for task structure and level of difficulty. The first is a paired-associate learning task developed by Stark (1961). Subjects must learn the correct responses which accompany the stimulus items; one component of the task involves word stimulus-response pairs, and one component uses pairs of geometric figures. Stark constucted the task so that a group of 20 mixed-sex normal individuals obtained equivalent scores on the component tests. She found that a group of 20 right-hemisphere damaged subjects did poorly on the visual-spatial measure but not on the verbal, and a group of 20 left-hemisphere damaged subjects were impaired on the verbal measure and not the visual-spatial. Further work with this measure has revealed a sex difference in the performance of normal subjects: men scored fewer

errors than women on the visual-spatial task, and women performed better than men on the verbal task. In addition, whereas component scores of women tended to be equivalent, those of the men were quite discrepant (Fabian, Parsons, & Shelton, 1983; Stanulis, 1976), supporting other findings of a greater lateralization of abilities in men. Sex differences were also revealed in a pathological population: the effects of alcoholism were different for the sexes. Alcoholic women were not impaired on either the verbal or visual-spatial measure, but alcoholic men demonstrated deficits in visual-spatial performance and showed significantly less discrepancy between component scores than control men (Fabian et al., 1983).

The second cognitive measure used in this study is the Verbal Spatial Relations Test (VSRT: Hartlage, 1969). A test of syllogistic reasoning, it has 16 spatial relations problems and 16 nonspatial problems; normals obtained similar scores on both types of questions (Hartlage, 1969). In a study with schizophrenic male veterans, Hartlage and Garber (1976) found impairment in spatial reasoning ability, indicating a selective spatial deficit independent of verbal reasoning ability in chronic schizohrenics.

The primary aim of this study was to compare the pattern of verbal and spatial deficits in schizophrenic women versus men relative to their control subjects. Two

tests having verbal and spatial components equated for task structure and level of difficulty were administered. In accord with previous research, we expected to find sex differences in the nonschizophrenic subjects such that men outperformed women on the spatial measures, and women were superior to men on the verbal measures. Because the literature regarding neuropsychological functioning has many methodological problems and is inconclusive in male schizophrenics and nonexistent for female schizophrenics, it was difficult to predict schizophrenic performance. However, schizophrenic men were impaired on the spatial half of the VSRT in a previous study (Hartlage & Garber, 1976), therefore, we would expect the same results to obtain for schizophrenic men in the present study. For schizophrenic women, one might expect a more diffuse and perhaps less severe deficit than that manifested by schizophrenic men, consistent with results from other brain-damaged or pathological populations.

Verbal and spatial performances of schizophrenic men and women were further explored by examining the effects of general verbal intelligence on performance, as measured by the Shipley Institute of Living Scale (Shipley, 1940). In addition, the effects of amount of psychotropic medication, length of hospitalization, and type of schizophrenic disorder on cognitive performance were examined. Regarding the latter, schizophrenic subjects were examined along two dimensions: paranoid-nonparanoid

and process-reactive. Predictions were that subjects on the process end of the scale would perform more poorly than those on the reactive end, based on previous results (Heaton, Baade, & Johnson, 1978; Lilliston, 1970; Malec, 1978; Seidman, 1983), and that paranoids would perform better than nonparanoid schizophrenics. Although results of paranoid versus nonparanoid comparisons have been inconsistent (Chapman & Chapman, 1973; Seidman, 1983), most studies have suggested a lesser deficit or found no impairment in the paranoid schizophrenics (Goldstein & Halperin, 1977; Magaro & Page, 1983; Malec, 1978; Mirsky, 1969).

A secondary aim of this study was to compare male and female schizophrenics on epidemiological data and clinical symptomatology. For the latter, interview data were used to rate the severity of the subjects' symptoms in 18 different categories using the Brief Psychiatric Rating Scale (BPRS: Overall & Gorham, 1962). A factor analysis carried out on these categories described four symdromes: Thinking Disturbance, Anxious Depression, Hostile Suspiciousness, and Withdrawal Retardation (Overall & Klett, 1972). Consistent with previous results, we expected to find that women schizophrenics would have a later age of onset and first hospitalization than men; a better premorbid adjustment and, therefore, a lesser rating on the process dimension; and show more atypical, affective, and physically active symptoms than men. More

specifically, women would score higher than men on the BPRS factor Anxious Depression and lower on Withdrawal Retardation.

A corollary to the above aims was to describe and compare the characteristic profiles of this study's men and women schizophrenics using the epidemiological, clinical, and cognitive data. Given the lack of previous research in this area and the small number of subjects and large number of measures employed in the present study, this aspect of the study was regarded as highly exploratory and no additional predictions were advanced.

Chapter II

Method

Subjects

Subjects were four groups of 16 each: male and female schizophrenics and male and female control subjects. Groups were matched on age (overall $\underline{M}$ = 31.7 $\pm$ 7.4, range 20-52), education ($\underline{M}$ = 12.0 $\pm$ 1.7, range 8-16), and race (9-12 White, 4-5 Black, and 0-2 Hispanic subjects in each group). All subjects volunteered, gave their informed consent, and were paid for their participation. Schizophrenic subject selection was a three step process. First, 469 hospital charts (52% female) from the admissions wards (average length of stay about a month) of a state mental hospital were screened intermittently over a 6-month period. The following exclusion criteria were used: age greater than 55 or less than 20; educational level less than 8 years; total cumulative psychiatric hospitalization greater than 5 years (to minimize effects of institutionalization); evidence of significant CNS disease or trauma, e.g., Organic Brain Syndrome, history of seizures, unconsciousness for more than 6 hours, and 104° or higher fever sustained for greater than 24 hours; mental retardation; or excessive drug or alcohol

use. Briefly, patients were rejected if thay had received either drug or alcoholism treatment; currently consumed more than a few alcoholic drinks daily or drank large amounts episodically; smoked the equivalent of 1-2 joints or more of marijuana daily; had used heroin, LSD, or barbiturates more than a few times in the past year; abused prescription drugs such as Valium; reported a history of amphetamine use resulting in more than 48 hours of intoxication; or had used PCP more than 1-2 times. Step 2 of the selection process involved collecting more data relevant to the exclusion criteria by interviewing staff and potential subjects regarding questionable issues. Finally, patients meeting the above requirements were invited to participate (18 women and 13 men declined) and were administered a structured interview designed to elicit the full range of clinical symptomatology. Many patients were rejected after the interview for failing to meet diagnostic criteria for schizophrenia, and some were eliminated for suspected mental retardation after obtaining low scores on a cognitive screening instrument. Psychiatric subjects satisfied the requirements for schizophrenia outlined in the American Psychiatric Association's (1980) Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM III), and were also classified as to schizophrenic subtype according to DSM-III guidelines. The final sample was comprised of 8 hebephrenic (4 males), one catatonic (male), 8

undifferentiated (3 males), and 15 paranoid schizophrenics (8 males). Self-report and hospital records indicated that overall, the average age of onset of the schizophrenic disorder in the sample group was 20.7 ± 5.3 years, and the average age at first hospitalization was 23.1 ± 5.2 years. At the time of testing, they had been schizophrenic for about 10.4 years and reported an average total amount of hospitalization for psychiatric reasons of 23.1 ± 5.0 months. (For a more complete summary of demographic and epidemiological data, see Table 3. Because adequate information was not always available for these measures, incomplete data are presented.)

Normal control subjects were also screened for the same age, education, medical, mental retardation, and drug or alcohol use requirements as the psychiatric group. In addition, they were eliminated if they reported a history of psychiatric hospitalization. To obtain a normal control sample of similar socioeconomic class as the schizophrenic sample, control subjects were recruited from a nonprofit medical clinic serving a low income clientele.

Tests and Procedures

Demographic, epidemiological, and medical data were collected from personal interview, and in the case of the schizophrenic subjects, from hospital records as well. All screening, interviewing, and testing of schizophrenic subjects was carried out by a clinical psychology intern; control subjects were tested by a trained female

psychometrician. Subjects were screened for mental retardation using The Shipley Institute of Living Scale (Shipley, 1940), a short paper and pencil measure of general intelligence. It is comprised of a Vocabulary and an Abstract Reasoning section; furthermore, the Shipley Scale yields a Conceptual Quotient that is purported to assess brain dysfunction based on the ratio of the two scores. Schizophrenics were clinically interviewed according to the Present State Examination (Wing, Cooper, & Sartorius, 1974), a highly regarded structured interview which generally takes about an hour's time and was designed to reliably elicit a full range of clinical symptoms. Based on this information, subjects were evaluated using DSM-III criteria for schizophrenia. Immediately following the interview, the subject was rated for severity of symptoms (scale from 0-6, least to most severe) in 18 categories on the Brief Psychiatric Rating Scale. Data obtained from personal interview and hospital records were used to complete The Abbreviated Form of the Phillips Premorbid Adjustment Scale (Harris, 1975), which assesses patients along the process-reactive dimension. The verbal and spatial cognitive tasks were administered in one of two orders: Stark Verbal, Stark Visual-Spatial, and Verbal Spatial Relations Test; or VSRT, Stark Visual-Spatial, and Stark Verbal Test.

The Stark Paired-Associate Test is comprised of a verbal and visual-spatial component, each of which has an

"easy" and a "difficult" version with seven pairs of items. The standard administration (Stark, 1961) was used in the present study. Within each component, the easy versions are presented first to a criterion of two perfect trials, or a maximum of three trials; the difficult versions are learned to a criterion of two perfect trials, or a maximum of six. At the beginning of each version, the subject is given an "interference" trial in which he or she is shown the stimulus and instructed to make any response that comes to mind. For the verbal task, the stimuli are typewritten words on plain 5x7 inch (12.7 x 18.0 cm) cards; stimuli for the visual-spatial task consist of incomplete geometric figures drawn on the same size cards. The subject gives an oral response in the verbal task and draws in the portion of the figure necessary to properly complete it in the visual-spatial task. After every response throughout the test, the subject is provided with feedback by presenting the stimulus paired with its correct response. Scores consist of the total number of errors in the difficult version of each component (excluding the interference trials). In the present study, visual-spatial errors were scored independently by two examiners; the reliability between scorers was high, $\underline{r}(63) = .99$, p .001, and all 12 differences were resolved and a consensus reached.

The VSRT is a test of syllogistic reasoning comprised of 16 spatial relations questions intermixed with 16

nonspatial questions. The correlation of the spatial portion of the test with the space test from the Differential Aptitude Test (Bennett, Seashore, & Wesman, 1947) was .86 (Hartlage, 1969). Details of the test can be found in Hartlage (1969). Briefly, the two types of syllogisms are identically worded except for the space or nonspace content. An example of a spatial question is: "Mary is to the right of John. John is to the right of Bill. Bill is, a) to the right of Mary, b) to the left of Mary." The corresponding nonspatial question to the above might be: "Mary is smarter than John. John is smarter than Bill. Mary is, a) smarter than Bill, b) not as smart as Bill." The questions were read to each subject individually and the answers were recorded on an answer sheet. Scores were number of errors for each component test.

Chapter III

Results

Cognitive Data

Results of one-way analyses of variance indicated that there were no significant differences between the four groups in age or in education (both F's < 1). Test order effects were examined using t-test comparisons for the individual cognitive tests. There were no significant differences between performance of groups administered Order 1 versus those given Order 2 on any of these variables.

The Shipley Institute of Living Scale was administered to obtain a measure of general verbal intelligence (Vocabulary) and because brain-damaged populations are frequently found to be impaired on the Abstracting and Conceptual Quotient (C.Q.) measures. Results of two-way ANOVA's on Sex x Diagnosis (Schizophrenic, Control) revealed significant effects of diagnosis on all three measures: Vocabulary, $F(1,60) = 8.55$, $p < .01$; Abstracting, $F(1,60) = 62.39$, $p < .0001$; and C.Q., $F(1,60) = 35.63$, $p < .0001$. Mean scores and standard deviations for the cognitive variables are presented in Table 1 for the four groups.

INSERT TABLE 1 ABOUT HERE

Table 2 presents the results of a three-way ANOVA on Sex x Diagnosis (Schizophrenic, Control) x Task (Verbal, Visual-Spatial errors) with repeated measures over task for the Stark Paired-Associate Learning Test. Overall, there was a marked effect of diagnosis: schizophrenics performed far worse than control subjects. The significant Diagnostic Group x Test interaction suggested that the schizophrenic group exhibited a performance

INSERT TABLE 2 ABOUT HERE

pattern different from that of the control group. Because the three-way interaction was not significant, the two-way interaction, pictured in Figure 1, was further investigated using tests for simple main effects.

INSERT FIGURE 1 ABOUT HERE

Significant main effects of diagnostic group were found on both the Stark Verbal and Stark Visual-Spatial Tasks, $F(1,60) = 18.18$, $p < .001$, and $F(1,60) = 74.06$, $p < .0001$, respectively. Although schizophrenic performance was impaired on both component tasks, it can be seen (Figure 1) that they manifested a relatively larger spatial than verbal deficit (17.4 vs. 9.0 more errors than controls). Results of analyses of simple main effects of task revealed no difference in verbal and spatial test performance in schizophrenics, $F(1,60) = 2.22$, $p > .25$, but

showed a large discrepancy between component test performance in the control subjects, $F(1,60) = 30.93$, $p < .0001$. However, these findings will be reconsidered in light of additional analyses discussed below.

The significant interaction of Sex x Task, depicted in Figure 2, demonstrated the expected sex differences in verbal and spatial abilities and was further investigated in analyses of simple main effects. Although sex

INSERT FIGURE 2 ABOUT HERE

differences were not found on the visual-spatial component, $F < 1$, there was a significant main effect of sex for the verbal component, $F(1,60) = 7.85$, $p < .01$, with women outperforming men. Results of tests for simple main effects of task revealed significant differences in verbal and spatial performance patterns within the males, $F(1,60) = 20.70$, $p < .001$, but not in the female group, $F < 1$. Again, however, these results will be discussed further below.

Predictions of schizophrenic sex differences in level and pattern of deficit relative to their control groups were not well supported. The lack of a significant Sex x Group interaction suggested that male and female schizophrenics demonstrated a similar overall level of deficit relative to their control groups. The failure of the three-way Sex x Group x Task interaction to reach significance suggested that schizohrenic women manifested

the same pattern of relatively greater spatial than verbal impairment compared to normal control women as did schizophrenic men compared to normal control men. However, inspection of the four groups' visual and spatial performance patterns, illustrated in Figure 3, reveals that compared to each other, the female schizophrenics appeared to demonstrate a different pattern of performance

INSERT FIGURE 3 ABOUT HERE

than the male schizophrenics. Despite the lack of a significant three-way interaction, this trend was explored in a two-way ANOVA on Sex x Task within the schizophrenic group. The significant Sex x Task interaction, F (1,30) = 6.22, $p < .05$, suggested that performance patterns of schizophrenic men and women were not the same. This was further examined using paired t-tests comparing verbal and visual-spatial component scores within each subject. Results indicated that the obtained interaction was due to a significant discrepancy between verbal and spatial scores in the female schizophrenics (M = 5.07 $\pm$ 2.2, $t(14) = 2.34$, $p < .05$) and not in the males (M = 1.81 $\pm$ 2.1, $p > .3$).

Reference to Figure 3 also served to modify conclusions drawn regarding the significant Sex x Task interaction from the three-way ANOVA. Although results of simple main effects of task indicated that there was no significant difference between verbal and spatial errors in the female group (see Figure 2), it can be seen from

Figure 3 that this finding was due to opposite patterns of verbal and spatial errors exhibited by the female schizophrenic and control groups and that, in fact, female schizophrenic and control subjects differed markedly in performance patterns.

The Verbal Spatial Relations Test was also subjected to a three-way ANOVA on Sex x Diagnosis (Schizophrenic, Control) x Task (Verbal, Spatial) with repeated measures over task. As expected, there was a significant difference between schizophrenic and control groups, $F(1,60) = 10.82$, $p < .01$, with the former scoring more errors than the latter. However, unlike the Stark Test and contrary to expectations, no other significant effects or interactions were demonstrated.

In an attempt to account for as much of the variance in cognitive performance as possible, the effects of several different variables on the Stark Paired-Associate Learning and Verbal Spatial Relations Tests were examined. For the schizophrenics, amount of psychotropic medication was translated to Thorazine equivalents (Hollister, 1970) and correlated with the verbal and spatial measures of these tasks, but the correlations were low and nonsignificant. Similarly, correlations of cognitive performance with psychopathological severity, as measured by the Total Pathology Score on the BPRS; total amount of hospitalization; length of schizophrenic history; and process-reactive score, as measured by The

Abbreviated Form of the Phillips Premorbid Adjustment Scale (Harris, 1975), were also low and nonsignificant. Age of onset, however, was significantly related to one of the four measures, the verbal half of the VSRT, but did not remain significant when age was partialled out.

For all subjects, cognitive performances were correlated with Shipley Vocabulary scores to determine the relationship of general verbal intelligence to specific verbal and spatial abilities. Correlations were highly significant for both verbal and spatial measures on the Stark Test and the VSRT, ranging in value from .45 to .59 ($df = 63$, $p < .0001$). Therefore, the above analyses were repeated using Shipley Vocabulary scores as a covariate with the aim of removing the effects of general verbal intelligence.

The results of these covariance analyses were quite interesting and pointed out a difference between the Stark Test and the VSRT. For the three-way ANCOVA with repeated measures on the VSRT, the formerly significant effect of group was markedly decreased and failed to reach statistical significance when the variance due to Shipley Vocabulary was removed, $F(1,59) = 3.12$, $p = .08$. There were large effects of the covariate, Shipley Vocabulary, $F(1,59) = 35.61$, $p < .0001$.

In contrast, results from covarying Shipley Vocabulary scores on the Stark Test were relatively minor. On the three-way ANCOVA with repeated measures over task

presented in Table 2, the main effect of task and the interactions with task were not changed when the Shipley Vocabulary measure was used as a covariate. The significant group effect was slightly attenuated in the covariance analysis, $\underline{F}(1,59) = 36.63$, $p < .0001$, but remained highly significant. As with the VSRT and as expected from significant correlations leading to these analyses, the effects of Shipley Vocabulary were significant, $\underline{F}(1,59) = 13.06$, $p < .001$.

A further way to examine sources of variance in cognitive performance was to investigate differences in schizophrenic performance as a function of schizophrenic subtype. Two classification systems were examined: process-reactive and paranoid-nonparanoid. Process-reactive scores were correlated with verbal and spatial performances on the Stark Paired-Associate and Verbal-Spatial Relations Tests. Contrary to expectation, no significant relationships were found. The paranoid-nonparanoid dimension, dichotomized according to DSM III criteria, was examined in the same three-way ANOVA design presented earlier, except diagnostic group was expanded to three levels: control, paranoid schizophrenic, and nonparanoid schizophrenic subjects. There were approximately equal numbers of paranoid subjects in the male (N=8) as in the female (N=7) schizophrenic groups; and there were no significant

differences between the paranoid and nonparanoid groups in age or education.

The results of the three-way ANOVA on Sex x Diagnostic group (Control, Paranoid, Nonparanoid) x Task with repeated measures over task for the Stark Paired-Associate Learning Test were similar to the original findings. The main effect of diagnostic group was highly significant, $F(2,58) = 37.08$, $p < .001$, but must be interpreted in light of the interactions of test with sex, $F(1,58) = 14.14$, $p < .001$, and of test with diagnostic group, $F(2,58) = 15.48$, $p < .0001$. Again, due to the nonsignificant three-way interaction, tests for simple main effects were used to investigate the nature of the two-way interactions. Main effects of the diagnostic group were significant for both the verbal, $F(1,58) = 18.10$, $p < .0001$, and visual-spatial measures, $F(1,58) = 45.46$, $p < .0001$. Group differences for each component test were further examined using Duncan's Multiple Range Test. Results showed that the paranoid schizophrenics performed significantly better than the nonparanoid schizophrenics on both Stark measures as predicted, and that they scored significantly worse than control subjects on the visual-spatial measure but not on the verbal measure. Analyses of verbal and spatial performance pattern were carried out using tests for simple main effects of task for each group. The findings are illustrated in Figure

4. The nonparanoid schizophrenic group demonstrated no difference between verbal and visual-spatial abilities,

INSERT FIGURE 4 ABOUT HERE

$F < 1$. With data combined across gender, both the paranoid schizophrenic group and the control group demonstrated a significant discrepancy between verbal and visual-spatial abilities, $F(2,58) = 6.43$, $p < .01$ and $F(2,58) = 35.52$, $p < .0001$, respectively; however, it can be seen in Figure 4 that they showed opposite patterns of performance. Control subjects erred more on the verbal than the visual-spatial task, whereas the paranoid schizophrenic subjects erred more on the visual-spatial than the verbal task. Taken together, these findings clearly demonstrate a difference in level and pattern of performance within schizophrenic subgroups. Paranoid schizophrenics were superior to nonparanoid schizophrenics in both verbal and spatial abilites and showed a selective spatial deficit relative to control subjects, as opposed to the diffuse deficit manifested in the nonparanoid group.

Clinical Data

To compare epidemiological data for men and women schizophrenics (see Table 3), two-tailed t-tests were

INSERT TABLE 3 ABOUT HERE

used. As predicted, men schizophrenics had an earlier age of onset and earlier first hospitalization than women schizophrenics, but these differences were not

statistically significant; neither were significant differences found in length of schizophrenic history, total amount of schizophrenic-related hospitalization, or process-reactive rating. Indeed, although male schizophrenics were expected to have a lower rating on the Harris Adaptation of the Phillips Premorbid Adjustment scale, indicative of poorer premorbid adjustment and process schizophrenia, they actually scored slightly higher than did the female schizophrenic group.

Clinical symptom profiles were compared for men and women schizophrenics using the four factors derived from the 18 symptom categories of the Brief Psychiatric Rating Scale (see Table 3). As predicted, males scored higher than females on the Withdrawal Retardation factor, comprised of the individual categories of emotional withdrawal, motor retardation, and blunted affect. Females did not score higher than men on the Anxiety Depression factor, contrary to expectations. There were no significant differences between sexes on the remaining two factors, Thinking Disturbance and Hostile Suspiciousness. Interestingly, male schizophrenics showed a significantly greater severity of disorder as measured by the Total Pathology Score. A comparison of male and female scores on the 18 BPRS symptoms is depicted in Figure 5. It can be seen that men and women manifested a similar profile of clinical symptoms. Indeed, the only

INSERT FIGURE 5 ABOUT HERE

effect of gender appeared to be a slight elevation of severity ratings in the males. Tentative exploration of the 18 individual categories using two-tailed t-tests revealed a range of items on which the males scored significantly higher as a group than the females, and included emotional withdrawal, mannerisms and posturing, grandiosity, and depressed mood.

To explore the relationship between diagnostic criteria (DSM-III), epidemiological data, and behaviorally rated clinical symptoms (BPRS), paranoid and nonparanoid schizophrenics were compared on epidemiological and clinical symptom variables using t-tests, although no a priori hypotheses had been advanced. These data are presented in Table 4. Paranoid schizophrenics showed a

INSERT TABLE 4 ABOUT HERE

later age of onset and first hospitalization than nonparanoid schizophrenics, although these differences failed to reach significance. The paranoid schizophrenics manifested a different BPRS clinical symptom profile than the nonparanoid schizophrenics, despite the fact that the Total Pathology Score was similar for the two groups. Consistent with clinical knowledge and criteria for classifying schizophrenic subtypes, the paranoid group scored significantly higher on the Hostile Suspiciousness factor than the nonparanoids, and furthermore, nonparanoid

schizophrenics scored higher than paranoid schizophrenics on the Thinking Disturbance factor. Finally, the paranoid group also scored higher than the nonparanoid group on the Anxiety Depression factor.

Chapter IV

Discussion

Cognitive Findings

The results of this study showed that first, as predicted, female control subjects outperformed male subjects on the Stark Paired-Associate measure of verbal abilities, although control males did not score better than females on the Stark measure of visual-spatial abilities. Furthermore, the same pattern of superior female verbal performance but no sex difference in visual-spatial abilities was found in the schizophrenic subjects. Second, the expected outcome of impaired spatial performance in male schizophrenics was found on both spatial measures, and verbal deficits were demonstrated as well. Third, evidence for the predicted schizophrenic gender differences in pattern or degree of deficit was ambiguous. When compared to their respective control groups, male and female schizophrenics showed a similar pattern of relatively greater spatial than verbal impairment. However, a trend for schizophrenic gender differences in performance pattern was suggested in that female schizophrenics performed significantly better on the verbal than on the spatial component measure, whereas

male schizophrenics performed equally poorly on both component measures. Fourth, analyses of schizophrenic subtypes indicated no relationship between the process-reactive nature of schizophrenia and cognitive performance in this study, but did find significant differences in both level and pattern of performance between the paranoid and nonparanoid schizophrenics. The paranoid schizophrenic group scored significantly better than the nonparanoid group on both verbal and spatial measures, however, they were still impaired relative to control group performance on the visual-spatial task.

One puzzling finding requiring exploration is the different results obtained with the Stark Paired-Associate and Verbal Spatial Relations Tests. Both purported to have measures tapping verbal and spatial abilities that were equated for level of difficulty, yet sex differences and interaction effects were demonstrated only with the Stark Test. Although the Stark test did find superior female verbal performance, the expected male superiority in visual-spatial performance found in previous studies (Fabian, Parsons, & Shelton, 1984; Stanulis, 1976) was not obtained. However, the present study used small samples and drew from a primarily lower-class population. Either of these variables could have influenced the present study's results. In addition, this study did not replicate Stark's normative results of equivalent verbal and visual-spatial performance in normal control

subjects. Her study employed very small sample sizes, however, and several subsequent studies obtained results similar to those in the present study (Fabian et al., 1984; Stanulis, 1976).

The Stark Test proved to be highly sensitive to schizophrenic impairment even after the effects of general verbal intelligence were removed, and showed a differential effect of schizophrenia on verbal and spatial abilities, suggesting that it measures specific abilities rather than general intelligence. On the other hand, the Verbal Spatial Relations Test did not demonstrate sex differences in tasks, and the obtained schizophrenic deficit failed to reach significance when the effects of general verbal intelligence were statistically controlled. These findings suggest that the VSRT may not have been as sensitive to schizophrenic impairment, and that both components of the task may be tapping some general level of verbal ability rather than specific verbal and spatial abilities. Indeed, Sternberg (1977) contends that syllogistic reasoning tasks are an excellent reflection of general verbal reasoning ability and intelligence.

An additional consideration is that VSRT results from this study were not the same as those reported by Hartlage and Garber (1969). They found a differential effect of schizophrenia such that chronic, V.A. "back ward" schizophrenic men were impaired only on the spatial and

not on the verbal components. However, his schizophrenic sample was quite different from that tested in the present study, and testing conditions also varied across studies (group vs. individual administration).

Another unexpected observation requiring explanation was the failure to replicate previous findings of differences in performance between process and reactive schizophrenics (Heaton, Baade, & Johnson, 1978; Seidman, 1983). The present study employed relatively small sample sizes and restricted the range of the process-reactive measure by imposing a five-year limit on cumulative hospitalizations in an attempt to minimize effects of institutionalization. This eliminated many chronic, possibly process, schizophrenics. More important in this author's opinion is the probable unreliability and lack of validity of this measure in the present study. Lack of adequate hospital record information often necessitated a reliance on schizophrenic self-report data.

Clinical Findings

Hypotheses for sex differences in epidemiology, premorbid adjustment, and clinical symptomatology were not well supported. First, as expected, women demonstrated a later age of onset and first hospitalization than did men, but this difference was not significant. Second, schizophrenic women clearly did not obtain scores indicative of better premorbid functioning and more reactive as opposed to process schizophrenia than

schizophrenic men, a finding not in accord with expectations based on previous results. Failure to replicate results of greater process schizophrenia ratings in males than females may be due to the limitations of the process-reactive measure as used in this study described above. Finally, although schizophrenic women did score lower than men on the BPRS factor Withdrawal Retardation as predicted, close examination reveals that they exhibited a similar profile of clinical symptoms as schizophrenic men, but that in general, their scores were slightly less elevated than those of the men.

There are a number of possible explanations for the lack of predicted sex difference found in schizophrenic symptom profiles. Previous investigations in this area have been few and have had serious methodological flaws, including inadequate diagnostic and screening criteria. The present study demonstrated that only 6.8% of an acute psychiatric population met rigorous screening criteria. It is unlikely that results obtained from a total acute psychiatric sample would apply to a well-diagnosed and well-screened sample of schizophrenic patients. Good diagnostic procedures would weed out schizoaffective or bipolar disorders, more common in women than in men, which would contribute to any observed sex differences. A second possible explanation is that more women were untestable or refused to participate than men; however, refusal rates were similar for the sexes. Anecdotal

experience of the examiner suggests that untestable patients were infrequent for either sex and that those of both sexes who refused to participate seemed quite withdrawn. Another possible explanation for the obtained results is that the BPRS is an instrument that measures current behavior and does not include admissions or other historical information that may more accurately reflect symptom differences in men and women. Finally, because the examiner was not blind to experimental conditions or hypothesized outcome, it is possible that rated scores of severity were biased. In any event, these results are certainly interesting and merit further experimental attention, especially with different measures of clinical symptomatology.

Integration and Summary

This paper presents the first systematic comparison of male and female schizophrenics in cognitive performance, epidemiology, and clinical symptoms. Men and women schizophrenics were similar in age, education, SES, race, frequency of various diagnostic subtypes, length of hospitalization, amount of medication, and process-reactive rating. They met DSM-III criteria for schiozphrenia based on a highly regarded structural interview, the P.S.E. (Wing, Cooper, & Sartorius, 1974), and were well-screened for any factor that might affect cognitive performance. Given these conditions, this study shows an overall similar pattern of clinical symptoms and

cognitive deficit in men and women schizophrenics. Women tended to have a slightly later age of onset and first hospitalization than men and manifested a lesser degree of pathology. In addition, they performed significantly better than men in verbal learning and showed a trend to perform differently than men in pattern of verbal and spatial errors. However, when compared to their respective control groups, they exhibited the same level and pattern of relatively greater spatial than verbal deficits. (Quite interesting is the observed similarity between female schizophrenics and paranoid schizophrenics in that both scored significantly more spatial than verbal errors, a finding that may be worthwhile to pursue in future research.) Several conclusions may be drawn from these data. First, men and women schizophrenics may differ in absolute level of verbal ability and in their relative pattern of verbal and spatial performance, suggesting that future studies in this area consider gender as a variable. Second, the similarity in clinical symptoms and in cognitive performance relative to that of their control groups suggests that the schizophrenic disorder has similar effects in both sexes, suggesting that underlying etiologies may not necessarily differ as a function of gender. Finally, based on the present results, treatment strategies for schizophrenic men and women need not differ markedly.

Combining across sex, results demonstrated that schizophrenic subjects were severely impaired on both verbal and visual-spatial learning, even after the effects of general intelligence were removed. Spatial abilities, usually associated with right hemispheric functions, appeared somewhat more impaired than verbal abilities in the schizophrenic group, relative to control group performances. These data do not support conclusions that schizophrenics have a selective left hemisphere dysfunction (Flor-Henry, 1976; Gruzelier & Hammond, 1976; Gur, 1978; Taylor, Greenspan, & Abrams, 1979). The use of verbal and spatial tasks matched for structure and level of difficulty may make interpretations of type and severity of deficit more meaningful.

The picture of schizophrenic deficit may be clarified by considering schizophrenic subtypes and thereby reducing group variability. Surprisingly, no differences in cognitive performance were found as a function of process-reactive rating; however, these primarily self-report data may not be valid. The paranoid-nonparanoid classification revealed a different level and pattern of cognitive performance in the two schizophrenic subtypes, indicating a specific, moderate spatial deficit in paranoid schizophrenics, as opposed to a more severe diffuse deficit in nonparanoid schizophrenics. Furthermore, paranoid schizophrenics manifested a different profile of clinical symptoms,

although overall severity of psychopathology was no different from nonparanoid schizophrenics. These findings have considerable implications. They clearly show the necessity of using matched tasks so that valid comparisons of different abilities can be made, and also dictate the need to improve homogeneity of the schizophrenic disorders by classifying on subtype or other relevant dimensions. More specifically, the cognitive and clinical differences found between paranoid and nonparanoid schizophrenics suggest different brain pathologies (e.g., the observed spatial deficit in the paranoid group may be indicative of a more localized right hemisphere deficit) and different underlying etiologies for the two types of disorder. Treatment personnel should bear in mind the fact that many schizophrenics do show cognitive impairment, and that maximally effective treatment strategies may differ as a function of subtype, e.g., paranoid schizophrenics should receive treatment aimed at a higher cognitive level than that given to nonparanoid schizophrenics. In general, these results are in accord with Seidman's (1983) conclusions that schizophrenics that differ in symptom profiles ("negative" vs. "positive") and neuropsychological performance tend to differ in type and severity of brain abnormalities as documented by neuroanatomical, neurophysiological, and neurological data, suggesting the existence of two or more discrete types of schizophrenia with different etiologies and prognoses.

References

Abrams, R., & Taylor, M. A. (1979). Differential EEG patterns in affective disorder and schizophrenia. Archives of General Psychiatry, 36, 1355-1358.

Allon, R. (1971). Sex, race, socioeconomic status, social mobility, and process-reactive ratings of schizophrenics. Journal of Nervous and Mental Disease, 153, 343-350.

American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (3rd ed.). Washington, DC: Author.

Becker, W. C. (1956). A genetic approach to the interpretation and evaluation of the process-reactive distinction in schizophrenia. Journal of Abnormal and Social Psychology, 53, 229-236.

Beaumont, J. G., & Dimond, S. J. (1973). Brain disconnection and schizophrenia. British Journal of Psychiatry, 123, 661-662.

Bennett, G. K., Seashore, A. G., & Wesman, A. G. (1947). The differential aptitude tests. New York: Psychological Corporation.

Buchsbaum, M. A. (1977). Psychophysiology and schizophrenia. Schizophrenia Bulletin, 3, 7-14.

Chapman, L., & Chapman, J. (1973). Disordered thought in schizophrenia. New York: Appleton-Century-Crofts.

Cheek, F. A. (1964). A serendipitous finding: Sex roles and schizophrenia. Journal of Abnormal Psychology, 69, 392-400.

DeWolfe, A. S., Barrell, R. P., Becker, B. C., & Spaner, F. E. (1971). Intellectual deficit in chronic schizophrenia and brain damage. Journal

of Consulting and Clinical Psychology, 36, 197-204.

Donnelly, E. F., Weinberger, D. R., Waldman, I. N., & Wyatt, R. J. (1980). Cognitive impairment associated with morphological brain abnormalities on computed tomography in chronic schizophrenic patients. Journal of Nervous and Mental Disease, 168, 305-308.

Fabian, M. S., Parsons, O. A., & Shelton, M. D. (1984). Effects of gender and alcoholism on verbal and visual-spatial learning. Journal of Nervous and Mental Disease, 172, 16-20.

Fleck, S., Lidz, T., & Cornelison, A. (1963). Comparison of parent-child relationships of male and female schizophrenic patients. Archives of General Psychiatry, 8, 1-7.

Flor-Henry, P. (1976). Lateralized temporal-limbic dysfunction and psychopathology. Annals of the New York Academy of Sciences, 280, 777-797.

Golden, C. J. (1976). Identification of brain disorders by the Stroop Color and Word Test. Journal of Clinical Psychology, 32, 654-658.

Goldstein, G. (1978). Cognitive and perceptual differences between schizophrenics and organics. Schizophrenia Bulletin, 4, 160-185.

Goldstein, G., & Halperin, K. M. (1977). Neuropsychological differences among subtypes of schizophrenia. Journal of Abnormal Psychology, 86, 34-40.

Gross, L. (1959). MMPI L-F-K relationships with criteria of behavioral and social adjustment in a schizophrenic population. Journal of Consulting Psychology, 23, 319-323.

Gruzelier, J. H., & Hammond, N. V. (1976). Schizophrenia: A dominant hemisphere temporal-limbic disorder? Research Communication in Psychology, Psychiatry and Behavior, 1, 33-72.

Gur, R. E. (1978). Left hemisphere dysfunction and left hemisphere overactivation in schizophrenia. Journal of Abnormal Psychology, 87, 226-238.

Gur, R. E. (1979). Cognitive concomitants of hemispheric dysfunction in schizophrenia. Archives of General Psychiatry, 36, 269-274.

Hannay, H. J., & Malone, D. R. (1976). Visual field recognition memory for right-handed females as a function of familial handedness. Cortex, 12, 41-48.

Harris, J. G., Jr. (1975). An abbreviated form of the Phillips Rating Scale of Premorbid Adjustment in schizophrenia. Journal of Abnormal Psychology, 84, 129-137.

Harris, L. J. (1978). Sex differences in spatial abilities: Possible environmental, genetic, and neurologic factors. In M. Kinsbourne (Ed.), Asymmetrical function of the brain. New York: Cambridge University Press.

Hartlage, L. C. (1969). Nonvisual test of spatial abilities. Proceedings, 77th Annual Convention, American Psychological Association, 163-164.

Hartlage, L. C., & Garber, J. (1976). Spatial vs. nonspatial reasoning ability in chronic schizophrenia. Journal of Clinical Psychology, 32, 235-237.

Heaton, R. K., Baade, L. E., & Johnson, K. L. (1978). Neuropsychological test results associated with psychiatric disorders in adults. Psychological Bulletin, 85, 141-162.

Hogarty, G. E., Goldberg, S. C., Schooler, N. R., & Ulrich, R. F. (1974). Drug and sociotherapy in the aftercare of schizophrenic patients. Archives of General Psychiatry, 31, 603-618.

Hollister, L. E. (1970). Choice of antipsychotic drugs. American Journal of Psychiatry, 127, 186-190.

Inglis, J., & Lawson, J. S. (1981). Sex differences in the effects of unilateral brain damage on intelligence. Science, 212, 693-694.

Kail, R. V., & Siegel, A. W. (1978). Sex and hemispheric differences in the recall of verbal and spatial information. Cortex, 14, 557-563.

Klorman, R., Strauss, J., & Kokes, R. (1977). The relationship of demographic and diagnostic factors to measures of premorbid adjustment in schizophrenia. Schizophrenia Bulletin, 3, 214-225.

Kokes, R., Strauss, J. S., & Klorman, R. (1977). Measuring premorbid adjustment: The instruments and their development. Schizophrenia Bulletin, 3, 186-213.

Lewine, R. R. J. (1981). Sex differences in schizophrenia: Timing or subtypes? Psychological Bulletin, 90, 423-444.

Lilliston, L. (1970). Tests of cerebral damage and the process-reactive dimension. Journal of Clinical Psychology, 26, 180-181.

Maccoby, E. E., & Jacklin, C. N. (1974). The psychology of sex differences. Stanford, CA: Stanford University Press.

Malec, J. (1978). Neuropsychological assessment of schizophrenia versus brain damage: A review. Journal of Nervous and Mental Disease, 166, 507-516.

Magaro, P. A., & Page, J. (1983). Brain disconnection, schizophrenia and paranoia. Journal of Nervous and Mental Disease, 171, 133-140.

Marin, R. S., & Tucker, G. J. (1981). Psychopathology and hemispheric dysfunction. Journal of Nervous and Mental Disease, 169, 546-557.

McGlone, J. (1978). Sex differences in functional brain asymmetry. Cortex, 14, 122-128.

McGlone, J., & Kertesz, A. (1973). Sex differences in cerebral processing of visuospatial tasks. Cortex, 9, 313-320.

Mirsky, A. F. (1969). Neuropsychological bases of schizophrenia. Annual Review of Psychology, 20, 321-348.

Newlin, D. B., Carpenter, B., & Golden, C. J. (1981). Hemispheric asymmetries in schizophrenia. Biological Psychiatry, 16, 561-582.

Overall, J. E., & Gorham, D. R. (1962). The Brief Psychiatric Rating Scale. Psychological Reports, 10, 799-812.

Overall, J. E., & Klett, C. J. Applied multivariate analysis. (1972). New York: McGraw Hill Book Co.

Piran, N., & Bigler, E. D. (1981, August). A neuropsychological investigation of the theory of schizophrenia. Paper presented at the meeting of The American Psychological Association, Los Angeles, CA.

Rosenthal, D. (1962). Family concordance by sex with respect to schizophrenia. Psychological Bulletin, 59, 401-421.

Rosenthal. D. (1977). Searches for the mode of genetic transmission in schizophrenia: Reflections and loose ends. Schizophrenia Bulletin, 3, 268-276.

Rosenthal, R., & Bigelow, L. B. Quantitative brain measurements in chronic schizophrenia. British Journal of Psychiatry, 121, 259-264.

Seidman, L. J. (1983). Schizophrenia and brain dysfunction: An integration of recent neurodiagnostic findings. Psychological Bulletin, 94, 195-238.

Shipley, W. C. (1940). A self-administering scale for measuring intellectual impairment and deterioration. Journal of Psychology, 9, 471-477.

Stanulis, R. G. (1976). Performance on matched verbal and visuospatial

learning tasks as a function of age. Unpublished master's thesis, Wayne State University, Detroit, MI.

Stark, R. (1961). An investigation of unilateral cerebral pathology with equated verbal and visuospatial tasks. Journal of Abnormal and Social Psychology, 62, 282-287.

Sternberg, R. J. (1977). Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities. Hillsdale, NJ: Lawrence Erlbaum Associates.

Taylor, M. A., Greenspan, B., & Abrams, R. (1979). Lateralized neuropsychological dysfunction in affective disorder and schizophrenia. American Journal of Psychiatry, 136, 1031-1034.

Taylor, M. A., Redfield, J., & Abrams, R. (1981). Neuropsychological dysfunction in schizophrenia and affective disease. Biological Psychiatry, 16, 467-478.

Torrey, E. F. (1980). Neurological abnormalities in schizophrenic patients. Biological Psychiatry, 15, 381-388.

Tsuang, M. T., Dempsey, G. M., & Rauscher, F. (1976). A study of "atypical schizophrenia": Comparison with schizophrenia and affective disorder by sex, age of admission, precipitant, outcome and family history. Archives of General Psychiatry, 33, 1157-1160.

Wahl, O. F. (1977). Sex bias in schizophrenia research: A short report. Journal of Abnormal Psychology, 86, 195-198.

Watt, N. F. (1972). Longitudinal changes in the social behavior of children hospitalized for schizophrenia as adults. Journal of Nervous and Mental Disease, 155, 42-54.

Watt, N. F. (1978). Patterns of childhood social development in adult schizophrenia. Archives of General Psychiatry, 35, 160-165.

Wing, J. K., Cooper, J. E., & Sartorius, M. (1974). The measurement and classification of psychiatric symptoms. London: Cambridge University Press.

Witelson, S. (1976). Sex and the single hemisphere: Specialization of the right hemisphere for spatial processing. Science, 193, 425-427.

Wittig, M. A., & Petersen, A. C. (1979). Sex-Related differences in cognitive functioning. New York: Academic Press.

World Health Organization. (1973). The international pilot study of schizophrenia. Geneva: Author.

World Health Organization. (1975). Schizophrenia: A multinational study. Geneva: Author.

Table 1

Cognitive Performances of Male and Female Schizophrenics and Male and Female Control Subjects

		Schizophrenics		Controls	
Measure		Male	Female	Male	Female
Shipley					
Vocab-	M	25.87	25.69	29.12	29.00
ulary	SD	4.1	5.6	4.2	3.9
Abstract-	M	12.62	13.25	29.12	26.25
ing	SD	9.2	7.1	6.2	7.1
C.Q.	M	73.75	76.13	98.19	92.25
	SD	16.7	12.9	12.3	11.9
Stark					
Verbal	M	23.62	16.31	13.38	9.43
	SD	11.8	8.3	7.6	5.5
Visual-	M	21.81	21.81	3.94	5.12
Spatial	SD	9.8	9.9	4.0	3.2
VSRT					
Verbal	M	5.87	6.12	3.50	4.56
	SD	2.4	3.3	2.7	3.1
Spatial	M	5.69	6.87	3.81	4.00
	SD	2.4	3.8	3.1	3.1

Table 2

Results of Three-Way ANOVA with Repeated Measures for the Stark Test

Source	df	Mean Square	*F* ratio
Sex (S)	1	202.51	1.94
Group (G)	1	5343.20	51.09*
S x G	1	41.63	0.40
Error	60	104.59	
Test (T)	1	202.51	8.28
T x S	1	309.38	12.65*
T x G	1	608.13	24.87*
T x S x G	1	9.57	0.39
Error	60	24.45	

*$p < .001$

Table 3

Comparison of Epidemiologic and Clinical Symptom Data For Men and Women Schizophrenics

Variable	n	Men M ± SD	Women M ± SD	t
Age of Onset	27[a]	19.61 ± 3.6	21.78 ± 6.4	1.06
Age at First Hosp.	29	22.00 ± 4.2	24.20 ± 6.0	0.97
Total Months of Hosp.	27	17.69 ± 16.7	13.28 ± 13.0	0.94
Years of Schiz. Illness	27	10.54 ± 7.0	10.36 ± 6.2	0.07
Process Score	31	6.31 ± 2.3	5.53 ± 2.5	0.89
BPRS Factors				
Think. Disturb.	32	7.69 ± 3.7	7.06 ± 2.6	0.55
Anx. Depress.	32	2.12 ± 2.1	1.56 ± 1.6	0.86
Host. Susp.	32	3.62 ± 3.2	3.25 ± 1.9	0.42
With. Retard.	32	4.31 ± 1.7	3.25 ± 1.5	1.88[c]
BPRS Total Pathology Score	32	24.62 ± 6.9	19.37 ± 7.2	2.10[b]

[a] Incomplete data are due to unavailability of necessary information.

[b] $p < .05$.

[c] $p < .10$.

Table 4

Comparison of Epidemiologic and Clinical Symptom Data For Paranoid and Nonparanoid Schizophrenics

Variable	n	Paranoid M ± SD	Nonparanoid M ± SD	t
Age at Onset	27[a]	22.83 ± 5.0	19.06 ± 5.1	1.93[c]
Age at First Hosp.	29	24.21 ± 5.0	22.13 ± 5.5	1.07
Process Score	31	6.28 ± 2.9	5.65 ± 2.0	<1
BPRS Factors				
Think. Disturb.	32	6.00 ± 2.6	8.59 ± 3.2	2.51[b]
Anx. Depress.	32	2.60 ± 2.1	1.18 ± 1.3	2.25[b]
Host. Susp.	32	4.60 ± 2.4	2.41 ± 2.1	2.71[b]
With. Retard.	32	3.60 ± 1.4	3.94 ± 1.9	<1
BPRS Total Path. Score	32	22.80 ± 6.1	21.29 ± 8.6	<1

[a] Incomplete data are due to unavailability of necessary information.

[b] $p < .05$.

[c] $p < .10$.

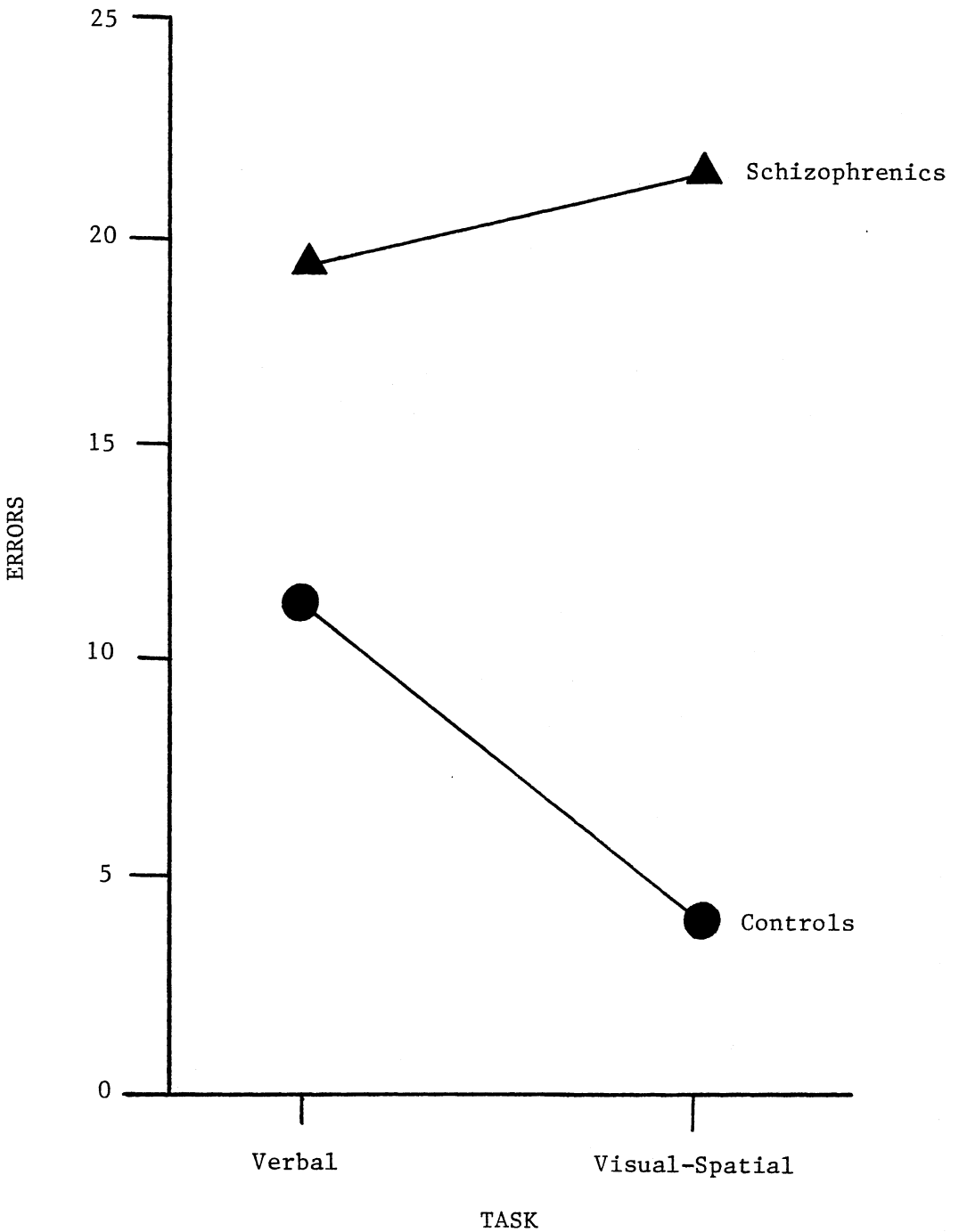


Figure 1. Stark verbal and visual-spatial error performance patterns of schizophrenic and control subjects.

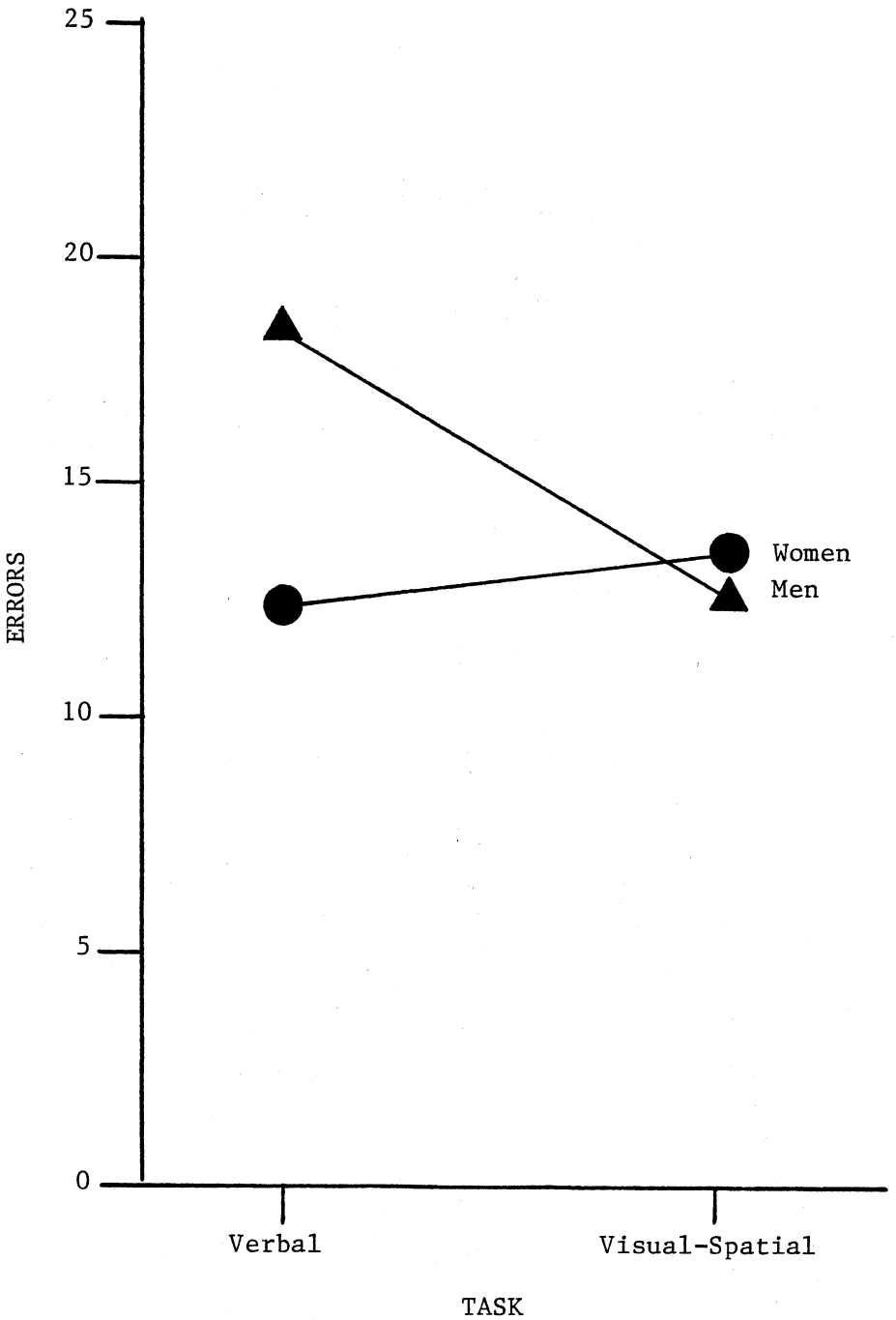


Figure 2. Stark verbal and visual-spatial error performance patterns as a function of gender.

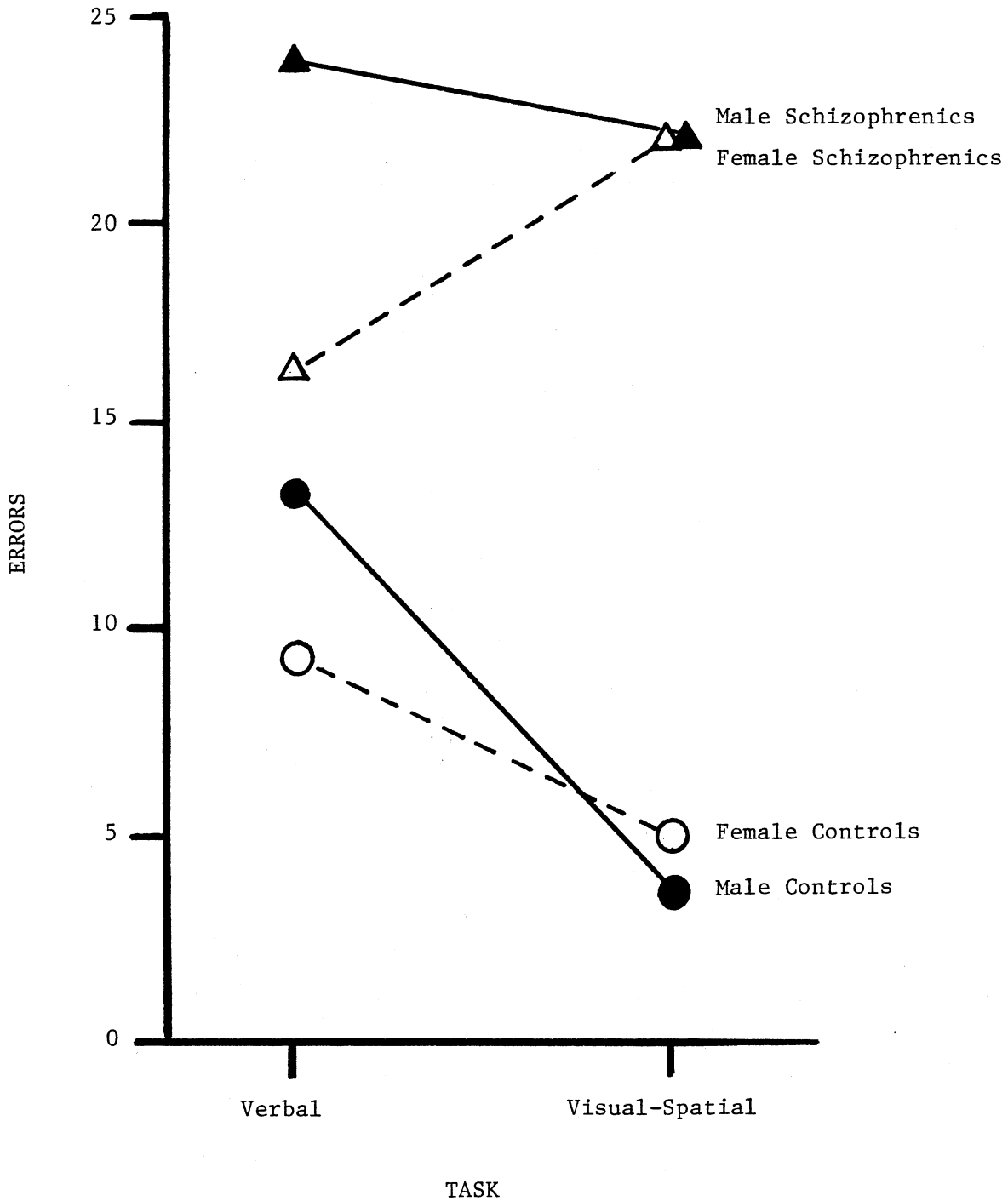


Figure 3. Stark verbal and visual-spatial error performance patterns of male and female schizophrenics and male and female control subjects.

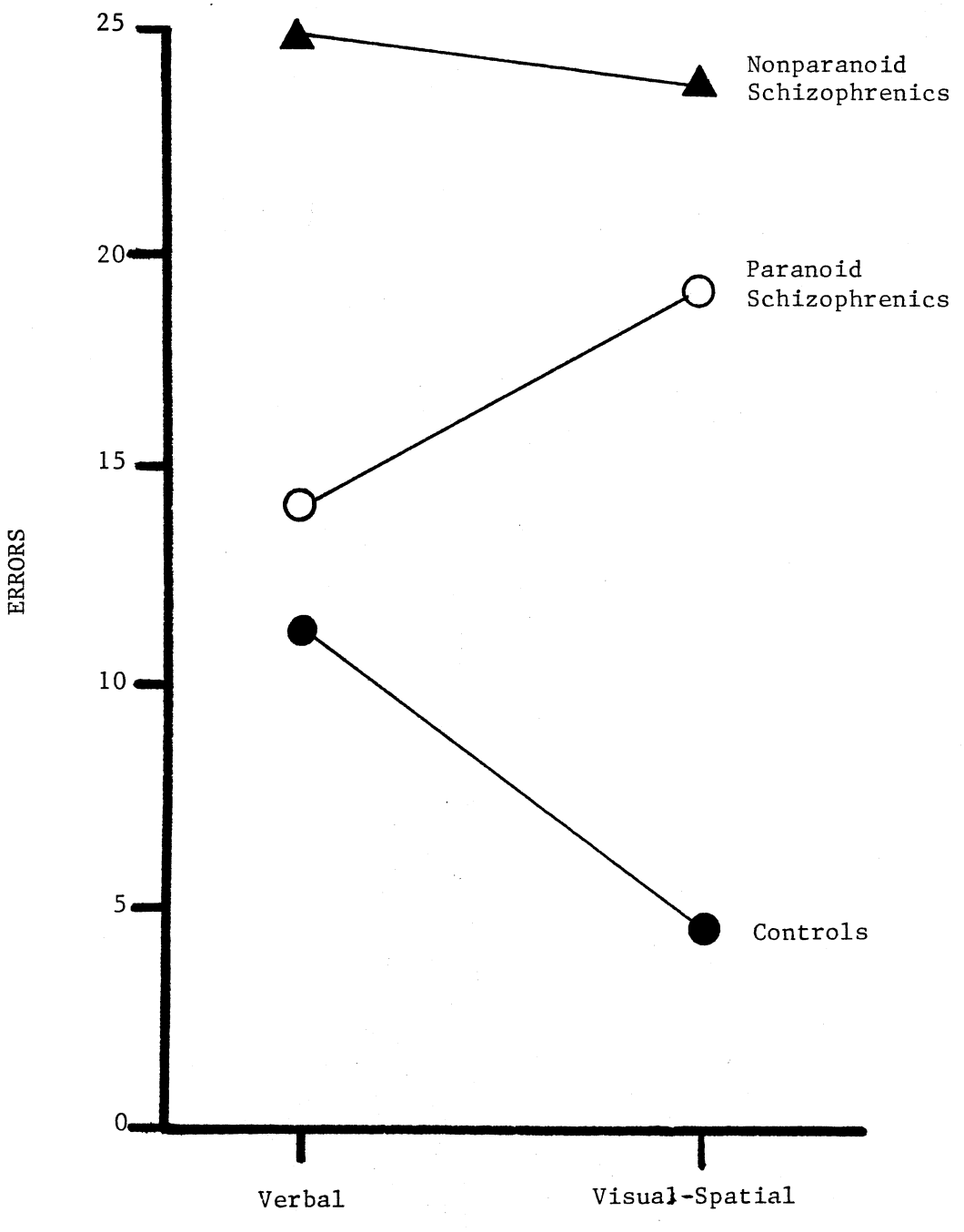


Figure 4. Stark verbal and visual-spatial error performance patterns of paranoid schizophrenics, nonparanoid schizophrenics, and control subjects.

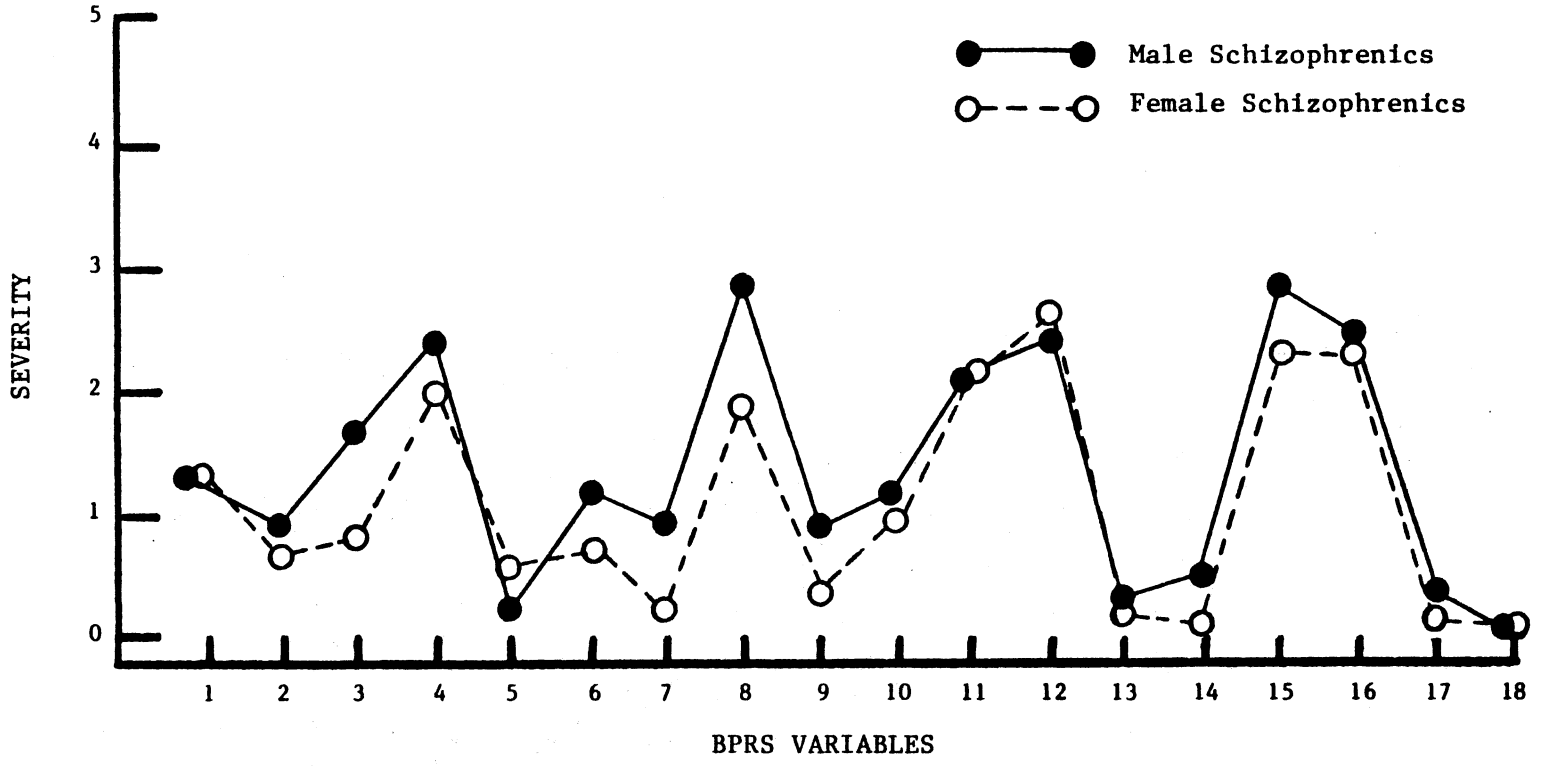


Figure 5. Comparison of BPRS clinical symptom profiles for subjects. Explanation of BPRS variables: 1 = somatic concern, 2 = anxiety, 3 = emotional withdrawal, 4 = conceptual disorganization, 5 = guilt feelings, 6 = tension, 7 = mannerisms and posturing, 8 = grandiosity, 9 = depressive mood, 10 = hostility, 11 = suspiciousness, 12 = hallucinatory behavior, 13 = motor retardation, 14 = uncooperativeness, 15 = unusual thought content, 16 = blunted affect, 17 = excitement, and 18 = disorientation.

Appendixes

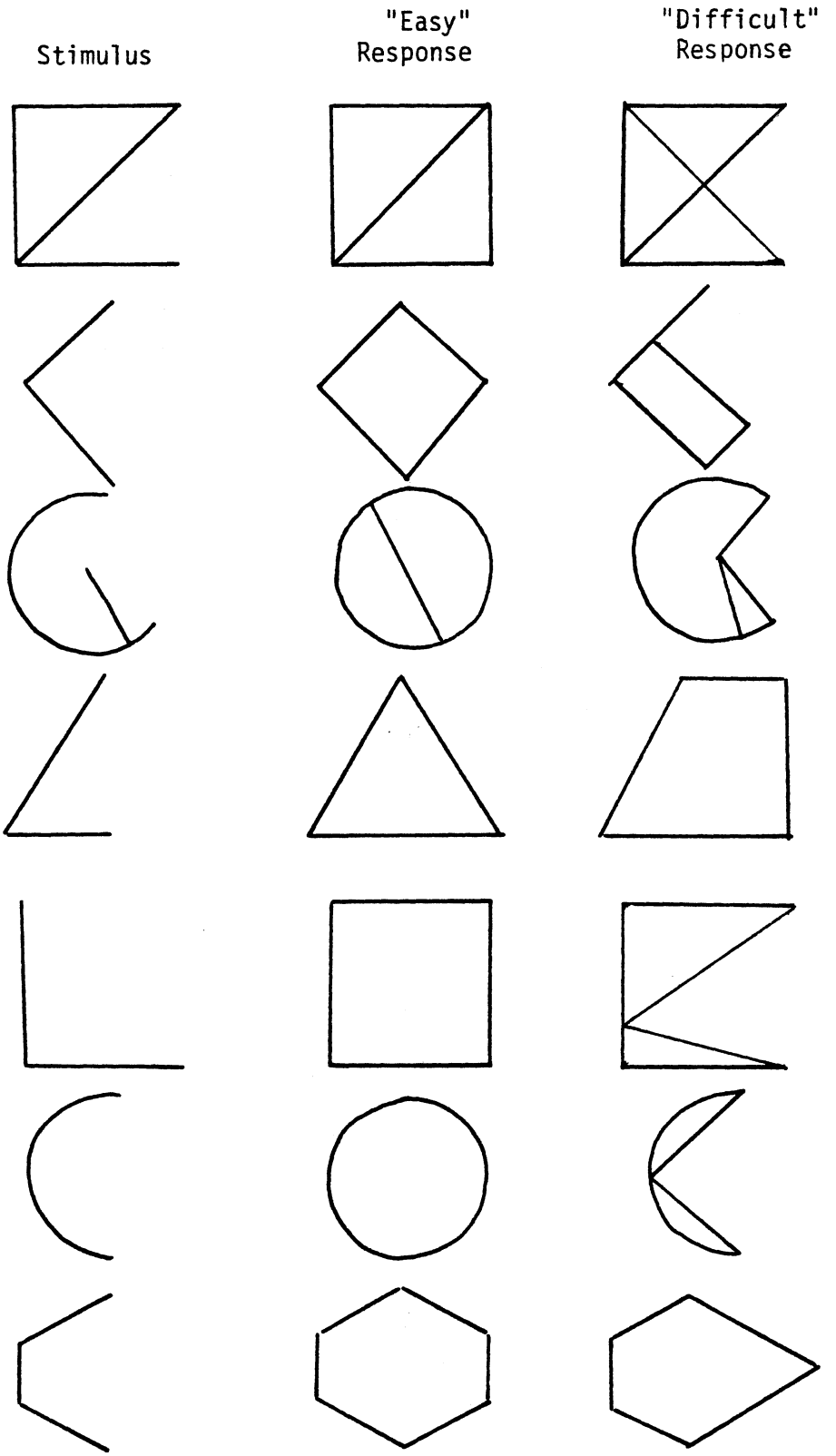
Appendix A

Cognitive Tests

STARK VERBAL TEST

Stimulus	"Easy" Response	"Difficult" Response
LONG	SHORT	HEALTH
SLOW	FAST	NEEDLE
BLOSSOM	FLOWER	HAMMER
HIGH	LOW	CHILD
DARK	LIGHT	SALT
CARPET	RUG	WHISTLE
BED	SLEEP	STREET

STARK VISUAL-SPATIAL TEST



VERBAL SPATIAL RELATIONS TEST

1. You are in front of Bill.
   Bill is in front of Mary.
   You are
   a. in back of Mary
   b. in front of Mary

2. You are faster than John.
   John is faster than Mary.
   You are
   a. slower than Mary.
   b. faster than Mary.

3. John is in front of Bill.
   Bill is in front of Mary.
   Mary is
   a. in front of John.
   b. in back of John.

4. Bill is friendlier than Mary.
   Mary is friendlier than John.
   Bill is
   a. friendlier than John.
   b. not so friendly as John.

5. You are on the right side of Bill.
   Bill is on the right side of Mary.
   You are
   a. on the left side of Mary.
   b. on the right side of Mary.

6. You are bigger than Mary.
   Mary is bigger thah Bill.
   You are
   a. smaller than Bill.
   b. bigger than Bill.

7. John is on the right side of Mary.
   Mary is on the right side of Bill.
   John is
   a. on the left side of Bill.
   b. on the right side of Bill.

8. John is smaller than Bill.
   Bill is smaller than Mary.
   Mary is
   a. smaller than John.
   b. bigger than John.

9. Mary is in front of you.
   You are in front of Bill.
   You are
   a. in front of Mary.
   b. in back of Mary.

10. Mary is smaller than you.
    You are smaller than Bill.
    Bill is
    a. smaller than Mary.
    b. bigger than Mary.

11. John is in front of Mary.
    Mary is in front of Bill.
    John is
    a. in back of Bill.
    b. in front of Bill.

12. John is faster than Mary.
    Mary is faster than Bill.
    John is
    a. slower than Bill.
    b. faster than Bill.

13. John is above Mary.
    Mary is above you.
    John is
    a. above you.
    b. below you.

14. You are bigger than Bill.
    Bill is bigger than Mary.
    Mary is
    a. smaller than you.
    b. bigger than you.

15. Mary is in back of Bill.
Bill is in back of John.
John is
a. in front of Mary
b. in back of Mary.

16. Mary is smaller than John.
John is smaller than Bill.
Mary is
a. bigger than Bill.
b. smaller than Bill.

17. John is friendlier than Bill.
Bill is friendlier than you.
John is
a. friendlier than you.
b. not so friendly as you.

18. You are in back of Bill.
Bill is in back of Mary.
Mary is
a. in front of you.
b. in back of you.

19. Bill is above Mary.
Mary is above John.
Bill is
a. above John.
b. below John.

20. John is bigger than Mary.
Mary is bigger than Bill.
John is
a. smaller than Bill.
b. bigger than Bill.

21. Mary is in back of you.
You are in back of Bill.
Mary is
a. in front of Bill.
b. in back of Bill.

22. John is on the left side of Bill.
Bill is on the left side of Mary.
Mary is
a. on the left side of Bill.
b. on the right side of Bill.

23. John is not so friendly as Mary.
Mary is not so friendly as you.
You are
a. friendlier than John.
b. not so friendly as John.

24. Mary is bigger than Bill.
Bill is bigger than John.
John is
a. smaller than Mary.
b. bigger than Mary.

25. You are on the left side of Bill.
Bill is on the left side of Mary.
Mary is
a. on the left side of Bill.
b. on the right side of Bill.

26. John is below Mary.
Mary is below Bill.
Bill is
a. above John.
b. below John.

27. You are slower than Bill.
Bill is slower than Mary.
Mary is
a. slower than Bill.
b. faster than Bill.

28. John is slower than Bill.
Bill is slower than Mary.
Mary is
a. slower than Bill.
b. faster than Bill.

29. John is below Mary.
Mary is below you.
You are
a. above John.
b. below John.

30. Mary is in back of John.
John is in back of Bill.
Mary is
a. in front of Bill.
b. in back of Bill.

31. Mary is smaller than you.
You are smaller than Bill.
Mary is
a. bigger than Bill.
b. smaller than Bill.

32. John is not so friendly as Mary.
Mary is not so friendly as Bill.
Bill is
a. friendlier than John.
b. not so friendly as John.

Appendix B

Clinical Data Forms

BRIEF PSYCHIATRIC RATING SCALE

Overall and Gorham (1962)

ITEMS	Not Present	Very Mild	Mild	Moderate	Moderately severe	Severe
1. Somatic Concern - Preoccupation with physical health, fear of physical illness, hypochondriasis.	0	1	2	3	4	5
2. Anxiety - Worry, fear, over-concern for present or future.	0	1	2	3	4	5
3. Emotional Withdrawal - Lack of spontaneous interaction, isolation, deficiency in relating to others.	0	1	2	3	4	5
4. Conceptual Disorganization - Thought processes confused, disconnected, disorganized, disrupted.	0	1	2	3	4	5
5. Guilt Feelings - Self-blame, shame, remorse for past behavior.	0	1	2	3	4	5
6. Tension - Physical and motor manifestations of nervousness, overactivation, tension.	0	1	2	3	4	5
7. Mannerisms and Posturing - Peculiar, bizarre, unnatural motor behavior (not including tics).	0	1	2	3	4	5
8. Grandiosity - Exaggerated self-opinion, arrogance, conviction of unusual power or abilities.	0	1	2	3	4	5
9. Depressive Mood - Sorrow, sadness, despondency; pessimism.	0	1	2	3	4	5
10. Hostility - Animosity, contempt, belligerence, disdain for other people.	0	1	2	3	4	5
11. Suspiciousness - Mistrust, belief others harbor malicious or discriminatory intent.	0	1	2	3	4	5
12. Hallucinatory Behavior - Perceptions without normal external stimulus correspondence.	0	1	2	3	4	5

		Not Present	Very mild	Mild	Moderate	Moderately severe	Severe
13.	Motor Retardation - Slowed, weakened movements or speech, reduced body tone.	0	1	2	3	4	5
14.	Uncooperativeness - Resistance, guardedness, rejection of authority.	0	1	2	3	4	5
15.	Unusual Thought Content - Unusual, odd, strange, bizarre thought content.	0	1	2	3	4	5
16.	Blunted Affect - Reduced emotional tone, reduction in normal intensity of feelings, flatness.	0	1	2	3	4	5
17.	Excitement - Heightened emotional tone, agitation, increased reactivity.	0	1	2	3	4	5
18.	Disorientation - Confusion or lack of proper association for person, place or time.	0	1	2	3	4	5

Abbreviated Scale of Phillips Premorbid Adjustment Scale (Harris 1975)

Abbreviated Scale of Premorbid Sexual Adjustment

I. Married, presently or formerly

(A) Married, only one marriage (or remarried only one time as a consequence of death of spouse), living as a unit

0 (a) Adequate heterosexual relations achieved

1 (b) Low sexual drive, difficult sexual relations, or extramarital affairs, either partner

(B) Married, more than one time, maintained a home in one marriage for at least 5 years

1 (a) Adequate sexual relations during at least one marriage

2 (b) Chronically inadequate sexual life

(C) Married and apparently permanently separated or divorced without remarriage,

2 but maintained a home in one marriage for at least 5 years

3 (D) Same as (C), but maintained a home in one marriage for less than 5 years

II. Single (30 years or over)

(A) Has been engaged one or more times or has had a long-term relationship (at least 2 years) involving heterosexual relations or apparent evidence for

3 a "love affair" with one person, but unable to achieve marriage

(B) Brief or short-term heterosexual or social dating experiences with one or

4 more partners, but no long-lasting sexual experiences with a single partner

(C) Sexual and/or social relationships primarily with the same sex, but may

5 have had occasional heterosexual contacts or dating experiences

6 (D) Minimal sexual or social interest in either men or women

III. Single (under 30 years, age 20-29)

(A) Has had at least one long-term "love affair" (minumum of 6 months to 1 year) or engagement, even though religious or other prohibitions or inhibitions may have prevented actual sexual union

1 (a) If ever actually engaged

2 (b) Otherwise

(B) Brief or short-term heterosexual or social dating experiences, "love affairs,"

3 with one or more partners, but no long-lasting sexual experiences with single partner

(C) Casual sexual or social relationships with persons of either sex, with no

4 deep emotional meaning

(D) Sexual and/or social relationships primarily with the same sex, but may have

5 had occasional heterosexual contacts or dating experiences

6 (E) Minimal sexual or social interest in either men or women

Abbreviated Scale of Premorbid Social-Personal Adjustment

(A) A leader or officer in formally designated groups, clugs, organizations, or

0 athletic teams in senior high school, vocational school, college or in youg adulthood

(B) An active and interested participant, but did not play a leading role in groups of friends, clubs, organizations or athletic teams in senior high school,

1 vocational school, college or in young adulthood

(C) A nominal member, but had no involvement in, or commitment to, groups of friends, clubs, organizations or athletic teams in senior high school, vocational

2 school, college, or in youjg adulthood

3 (D) From adolescence through early adulthood, had only a few casual or close friends

(E) From adolescence through early adulthood, had no real friends, only a few

4 superficial relationships or attachments to others

(F) From adolescence through early adulthood (i.e., after childhood) quiet, seclusive, preferred to be by self; minimal efforts to maintain any contact at

5 all with others

(G) No desire to be with playmates, peers, or others, from early childhood.

6 Either asocial or antisocial.

Appendix C

Correlation Table for Schizophrenics

Correlation Table for Schizophrenics

	Stark		VSRT	
	Verbal	Vis-Sp	Verbal	Spatial
	r (df)	r (df)	r (df)	r (df)
Shipley Vocabulary	-.32 (31)	-.26 (31)	-.32 (31)	-.46 (31)*
Age of Onset	-.34 (26)[a]	-.35 (26)	-.58 (26)*	-.28 (26)
Total Hosp.	.09 (26)	.02 (26)	-.01 (26)	-.19 (26)
Yrs. Schizo. Illness	.27 (26)	.15 (26)	.00 (26)	-.20 (26)
Process-Reac. Score	-.00 (30)	-.09 (30)	-.02 (30)	.09 (30)
Total Path. Score	.08 (31)	-.04 (31)	.24 (31)	-.00 (31)
Medications	-.00 (27)	.08 (27)	-.26 (27)	-.03 (27)

* $p < .01$

[a] Incomplete data are due to unavailability of necessary information.

VITA[2]

Marjorie Saile Fabian

Candidate for the Degree of

Doctor of Philosophy

Thesis: CLINICAL AND COGNITIVE SEX DIFFERENCES IN SCHIZOPHRENICS

Major Field: Clinical Psychology

Biographical:

Personal Data: Born in Newark, Delaware, on December 10, 1954, the daughter of Alvin and Laura Saile. Married to William D. Fabian, Jr., on April 12, 1980. Daughter Sara was born on January 11, 1983.

Education: Graduated from Robert E. Peary High School, Rockville, Maryland, in June 1972; received Bachelor of Science degree from The University of Maryland, College Park, Maryland, in May, 1976; received Master of Arts degree from The University of Florida, May, 1978; completed requirements for the Doctor of Philosophy degree at Oklahoma State University in July, 1984.

Professional Experience: Teaching Assistant, Department of Psychology, The University of Florida, August, 1976 to May, 1978; Project Director, "Women and Alcohol" Research Grant, Department of Psychiatry and Behavioral Sciences, The University of Oklahoma Health Sciences Center, August, 1978 to November, 1982; Psychology Practicum Student, Department of Psychology, Oklahoma State University, Aubust, 1980 to August, 1983; Teaching Assistant, Department of Psychology, Oklahoma State University, August, 1980 to August, 1982; Clinical Psychology Intern, Department of Psychiatry and Behavioral Sciences, The University of Oklahoma Health Sciences Center, August, 1983 to present.

Professional Organizations: Student Affiliate, American Psychological Association, January, 1984 to present.