1984

A Comparative Study of Computer Administration of the Minnesota Multiphasic Personality Inventory in an Inpatient Psychiatric Setting

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A COMPARATIVE STUDY OF COMPUTER ADMINISTRATION OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY IN AN INPATIENT PSYCHIATRIC SETTING

by

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A Dissertation Submitted to the Faculty of the Graduate School of Loyola University of Chicago in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

December

1984

ACKNOWLEDGMENTS

There are a number of people I would like to thank and acknowledge. First, I would like to thank my committee, Al DeWolfe, Ph.D., Toby Dye, Ph.D., and Leroy Wauck, Ph.D., who were supportive in their suggestions and criticisms and did a great deal to make this research a valuable experience for me. I would also like to thank those at Lakeside Veterans Medical Center who made this research possible, particularly, Jamés Choca, Ph.D., Chief, Psychology Section. I am also grateful to Psychological Assessment Resources, Incorporated who aided this research with a grant. Frank Slaymaker, Ph.D. deserves special thanks for his assistance with the statistical analysis. Throughout it all, Linda Brownell Bresolin, my wife, has continued to bring love, support, and joy into every aspect of my life. Finally, I would especially like to thank those who participated in the study for their cooperation and effort.

VITA

The author, Michael J. Bresolin, Jr., was born on March 29, 1954 in Chicago, Illinois. He is the son of Michael J. Bresolin, Sr. and Edna E. (Freistedt) Bresolin.

He obtained his secondary education at Quigley North Preparatory Seminary, Chicago, Illinois, where he graduated in 1972. In September, 1972, he entered Niles College of Loyola University of Chicago and majored in Psychology and Philosophy. In June, 1976, he received the degree of Bachelor of Science, Honors with a major in Psychology. While attending Niles College he studied one year at Loyola University's Rome Center.

In September, 1976, he entered a graduate program in Counseling Psychology at Loyola University of Chicago, being awarded the Master of Arts degree in June, 1978. From July, 1977 to May, 1979 he worked first as a psychology trainee and then as a psychological consultant to Liverpool Catholic Social Services, Liverpool, England.

In September, 1979, he entered Loyola University of Chicago's graduate program in Clinical Psychology and was awarded an USPH Fellowship. From June, 1980 through August, 1980 he completed a clerk-

ship in Clinical Psychology at Lakeside VA Medical Center. In September, 1980, he was granted a research assistantship. From September, 1981 through August, 1983 he worked at the Charles I. Doyle, S.J., Center and Day School of Loyola University as a Psychology Trainee. From October, 1983 through September, 1984 he completed an APA approved internship in Clinical Psychology at Hines VA Hospital, Hines, IL.

DEDICATION

To my wife,

Linda

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CHAPTER I

INTRODUCTION

"Computers can do almost everything these days, so it should come as no surprise that there is one that can diagnose your mental health" (Shuman, 1976, p.56). Shuman describes how a Control Data Corporation's Model 3200 computer was programmed to administer and interpret a battery of psychological tests. This effort to automate the administration and interpretation of psychological tests was pioneered by the University of Utah Medical Center and the Salt Lake City Veterans Administration Hospital. Because of the rapid pace of the application of computer technology to the administration and interpretation of psychological testing, research in this area completed as recently as 1976 can justifiably be characterized as "early."

In large part, progress in the area of test administration by computer has parallelled the development of small, increasingly powerful and portable micro-computers, more popularly known as "personal computers" (PC's). Only a few years ago computers cost a fortune, needed large air conditioned rooms to house them, and employed a team of specialists to keep them running. Computers which are faster, more powerful, and more versatile than the early mainframes now can be pur-

chased for a few thousand dollars. Some are so compact that they can be carried in a briefcase. "Personal computers," as we know them today, did not really exist until around 1975 with the creation of the Altair and Apple I. Since then, an incredible variety and quantity of hardware (actual equipment) and software (programs) have evolved for the PC market. By the end of 1983 there were an estimated 3.3 million microcomputers being used in the marketplace. Annual shipments for small computers are expected to quadruple by the end of 1987. Today, millions of homes and offices use PC's to perform tasks ranging from stock analysis to maintaining shopping lists, from word processing to playing video games, from automated banking to interstate chess games.

It is widely felt that small businesses which do not adopt some degree of office automation will be unable to remain competitive by the end of the decade. It should therefore come as no surprise that psychologists would turn to micro-computers to assist them in their work. The first application for many psychologists has been word processing to help in the preparation of reports and correspondences. Others began using PC's to maintain the records of their practices and develop "databases" consisting of demographic and clinical information on their patients. Still others began handling billing procedures, budget planning and other financial aspects of their practices using "electronic spreadsheets." There is now a new journal, Computers in Human Services, scheduled for release Spring, 1985, and a number of new books (e.g., Schwartz, M.D., 1984) devoted to exploring the poten-

tials of computer related technologies in mental health and other human services.

Mainframe computers have been utilized for a number of years to score and interpret psychological tests by mail. Research has shown that the reports generated by these mainframe programs are generally found to be clinically acceptable, diagnostically useful, and time-efficient (Adams, & Shore, 1976; Lachar, 1974a, 1974b). Other research has found that interpretive reports produced by mainframe computers of tests such as the Minnesota Multiphasic Personality Inventory (MMPI) and the Millon Clinical Multiaxial Inventory (MCMI) are judged by clinicians to be diagnostically and descriptively accurate (Green, 1982). Software is now available which enables a psychologist to use a micro-computer to score and interpret a variety of popular psychological tests such as the MMPI, the California Personality Inventory (CPI), the Beck Depression Inventory (BDI), and the MCMI. These programs produce statistical summaries of the results, graphic presentations of the profiles and automated prose reports comparable to those produced by mainframe programs.

The size, portability, and power of personal computers has now made it practical for psychologists to use PC's to actually administer psychological tests to their clients. The Psychological Corporation held the copyright for the MMPI until 1982. Psychological Corporation had begun to license other companies to produce software which not

only scored, but administered the MMPI. The National Computer Service (NCS), present holder of the MMPI copyright, was expected to continue this policy, but appears to be guarding the copyright (i.e., royalties) much more aggressively. NCS itself is now developing software to actually administer, score and interpret psychological tests on the IBM personal computer. Potentially, this is a tremendous step forward. With administration and scoring based on a micro-computer, the results of psychological testing can be available to the clinician immediately. Psychologists working in intake settings can interview a client after having the client complete psychological testing on a PC and then ask the client to wait while a decision is made based upon both test and interview data.

Computer-based administration of existing instruments can not only enhance the utility and value of psychological testing but reduce the cost (Byers, 1981; Elwood, 1972). Clients also tend to report favorable attitudes toward computer interviews, even preferring them to more traditional methods (Lucas, 1977). Further, as psychologists have become increasingly aware of the potential legal liability incurred during initial screening assessments, they have also recognized the need for more empirically based assessment procedures. Psychological testing using a small, portable PC (such as the recently introduced Apple IIc) may provide empirically sound results which are immediately available to the clinician for decision making.

There are a number of important research questions raised by the actual administration of psychological tests by computer. For instance, what are the possible effects of taking a particular test by computer rather than by more conventional means? Further, does computer-based administration interact with diagnosis in a psychiatric setting? Finally, are there important experiential differences between the administration methods even if these differences do not affect test results?

Since little research has been done to address these questions, and what has been done has tended to use college students rather than clinical populations, the present study was designed to assess whether computer-based administration of the MMPI is equivalent to conventional booklet (Form R) administration. It addressed this question using an inpatient psychiatric population and a carefully controlled experimental procedure which took diagnosis and previous experience with the MMPI into account. Experiential effects of the two administration methods were explored through the use of a questionnaire given to all subjects. By incorporating all of these features, the present study represents an attempt to further the understanding of an exciting, new aspect of psychological assessment: computer-based administration of psychological tests.

CHAPTER II

REVIEW OF RELATED LITERATURE

Research on the Automation of Psychological Testing

Automated Intelligence Testing. One of the earliest efforts to develop and evaluate an automated system capable of administering a commonly used psychological test is described by Elwood (1969, 1972) and by Elwood and Griffin (1972). Elwood described a system which could administer the Wechsler Adult Intelligence Scale (Wechsler, 1955). Further, he examined the relationship between test results obtained using conventional testing procedures and those obtained using the automated testing method.

In Elwood's studies the subjects sat in a portable sound-controlled room and signalled when they were ready for a new item by pressing a button. A case containing 12 drawers was located on either side of the subject. The drawers opened automatically and contained the test materials. A paper tape reader and digital logic system controlled the release of the drawers and measured the amount of time the subject worked on each drawer. The subject's performance was scored by examining the contents of the drawers and by noting the time required for each item.

Elwood (1969) reports that the scores obtained by 35 subjects in a counterbalanced, repeated-measures design were highly correlated and that these correlations were comparable to conventional test-retest reliabilities, as well as to the split-half reliabilities reported by Wechsler (1955). These findings are particularly remarkable when the crude nature of the automation is considered and given the fact that Elwood's (1969) sample contained a disproportionate number of mentally retarded subjects.

Following Elwood's lead, a small number of studies have proceeded to explore the effects of automated, computer-based intelligence testing. Overton and Scott (1972) examined automated administration of the Peabody Picture Vocabulary Test using an automatic visual display. Their sample consisted of 240 mentally retarded subjects. They found no significant differences in the mean scores for manual and automated testing.

Using a similar approach Knights, Richardson, and McNarry (1973) also compared automated and conventional administration of the Peabody Picture Vocabulary and a cognitive test of nonverbal problem-solving ability, Raven's Coloured Progressive Matrices. They also found that test-retest reliabilities were similar to those reported in the test manuals for both tests. They noted that the mentally handicapped children in their study enjoyed using the terminal, although lower scores were obtained when the automated version was administered

first. They felt that this was due to the retarded children's difficulty adapting to the novel situation presented by the automated procedure.

Hedl, O'Neil, and Hansen (1973) attempted to ascertain the emotional impact of computer-based intelligence testing. In order to assess the stress experienced by subjects being tested by computer rather than by more conventional means, they measured the fluctuations of anxiety at different points in time. Subjects' attitudes toward the testing procedures were also assessed. Using the Slosson Intelligence Test (Slosson, 1963) and the WAIS they tested the hypothesis that computer-based administration would result in a less stressful testing situation in comparison to examiner administration.

Their sample consisted of 48 undergraduate students who received the WAIS from an examiner, the Slosson from an examiner, and the Slosson from a computer in a counterbalanced Latin square design. The testing sessions were approximately one week apart. State anxiety and attitudes toward testing were evaluated by questionnaire before and after each testing session. State anxiety declined across the three testing sessions, as expected (Hedl, Note 1). However, the computer-based administration led to higher levels of state anxiety and less favorable attitudes toward the testing in comparison to either of the examiner administrations. Hedl et al. (1973) felt that this finding was the result of procedural variables rather than the computer per

se. For example, the computer continued to administer items even after the subject had failed 10 in a row. This was not the case with the examiner administrations. The authors concluded that procedural variables such as the clarity of instructions, unfamiliarity with terminal operation, and the nature of the interaction built into the computer program are of particular importance in determining the affective consequences of computer-based testing.

Computer Administration of Personality Measures. Medicine has long recognized the practical advantage of direct patient assessment and information gathering by computer. Slack, Hicks, Reed, and Van Cura (1966) published a report of how a small digital computer was used to obtain clinical histories from 50 asthma patients. They note that almost all of the patients found the study interesting and enjoyable. Twelve indicated a preference for physician historians, and 18 a preference for the computer-based system. The remaining 20 had no preference. None of the patients indicated a dislike for the computer-based system.

The influence of situational and interpersonal variables on measures of personality has long been of interest to researchers (Masling, 1960). Research has only begun to examine the influence of computer-based administration on personality assessment. Evan and Miller (1969) pioneered this area of research by exploring the differential effects on response bias of computer vs. conventional administration

of a social science questionnaire. They hypothesized that subjects would regard typing answers directly into a computer as a situation which guaranteed them a greater sense of privacy and anonymity than that of filling out a questionnaire which would be hand scored. Earlier, Smith (1963) hypothesized that "confession-type" questions requiring a straightforward, honest response to inquiries related to the subject's personal experience or characteristics might be more easily answered on the relatively impersonal computer. Smith (1963) felt that subjects would perceive the impersonal computer as more anonymous and, therefore, "safer" than conventional paper-and-pencil methods of test administration.

In fact, Evan and Miller's (1969) findings suggested that whenever the content of a question was regarded by a subject as highly personal and possibly disturbing, that subject responded with greater honesty and candor with computer-based administration than with conventional questionnaire administration. Further, their results also tended to show that when an impersonal, emotionally neutral question was asked, no tendency to respond with greater honesty or candor was observed. Their questionnaire consisted of the entire Allport-Vernon-Lindzey test of individual values, questions from the Minnesota Multiphasic Personality Inventory (MMPI) relating to manifest anxiety, the Lie Scale of the MMPI, questions from the Srole Scale (1956) of perceived sociocultural anomie (existential despair), and questions constructed by the experimenters to be "neutral".

Evan and Miller's (1969) study was beset by a number of problems, however. The questionnaires were administered to a restricted and homogeneous sample of 60 M.I.T. undergraduate students. There also was a significant interaction between computer knowledge/experience and treatment. Further, all but one of their hypotheses were supported only by statistical trends. Despite these problems, Evan and Miller's (1969) study was an important exploratory effort and one of the first research projects of its kind.

In a more recent study of the effects of direct assessment by computer, Skinner and Allen (1983) did not find that a computerized interview influenced the quality of information obtained about drug, alcohol, or tobacco use. However, other research has generally supported the hypothesis that direct interaction with a computer is perferred by subjects when they are disclosing sensitive information (Greist & Klein, 1980). High school students, for example, were found to prefer a computer administered questionnaire over a paper-and-pencil method when they were being questioned about drug and alcohol abuse (Greist, 1975). Lucas, Mullin, Luna, and McInroy (1977) also found that clients reported consuming greater amounts of alcohol when questioned by computer. Since research has shown (Pernanen, 1974) that individuals tend to underreport the amount of alcohol they actually consume, the findings of Lucas et al. (1977) imply that people were more honest when questioned by computer.

About the same time as Evan and Miller's (1969) research, Kleinmuntz and McLean (1968) in an effort to devise a short form of the MMPI developed a program which administered the test using a system of computer-controlled branching. The program selected and administered subsets of MMPI items based on the subject's responses to certain "critical items." Kleinmuntz and McLean (1968) found, however, that the goodness of fit between the computer-controlled branching system and the long form of the MMPI was relatively poor.

In 1972 Dunn, Lushene, and O'Neil reported the first successful administration, scoring, and interpretation of the entire MMPI by computer. Except for Kleinmuntz and McLean's (1968) computer-controlled branching study, the computer had previously only been used to score and interpret the MMPI, not to administer it (Finney, 1966; Fowler, 1969; Rome, Swenson, Mataya, McCarthy, Pearson, & Keating, 1962). Dunn et al. (1972) recorded response latencies for approximately 125 undergraduate students on each of the 566 items and compared these latencies with various item characteristics. The only notable problem they observed with the computerized administration was the inability of subjects to correct mistakes. They did not include this feature because of their desire to measure response latency accurately.

In regard to response latency, Dunn et al. (1972) found that reading time accounted for 47% to 58% of the variance. Rated ambiguity, social desirability, and the social desirability dispersion

together accounted for only an additional 6% of the variance in the response latencies. The authors concluded that perhaps the significance of these variables, at least in terms of response latency, has been overemphasized.

Lushene, O'Neil, and Dunn (1974) tested 63 female students and compared computerized versus booklet administration of the MMPI. They used a counterbalanced design and found that the test-retest correlations between the two modes of administration were as high or higher than those reported for booklet-booklet or booklet-card form administrations.

Lushene et al. (1974) included an anxiety measure developed by O'Neil (1972) and found that the computer administration initially produced higher state anxiety than the booklet administration. However, by the end of the testing session no difference in the levels of state anxiety between the two modes of administration was observed. Using the computer to administer the State-Trait Anxiety Inventory for Children and the FIRO personality scales, Katz and Dalby (1981b) also found significant decreases in state anxiety from first to second testing sessions. The results of both Lushene et al. (1974) and Katz and Dalby (1981b) are in contrast to those of Hedl et al. (1973), cited above, in which state anxiety was found to be elevated throughout the computerized administration of the Slosson Intelligence Test.

Recently, Katz and Dalby (1981a) published another study comparing computer and manual administration of the Eysenck Personality Inventory. Notably, they used a clinical population for their research, albeit a small one (10 outpatients and 8 inpatients). Citing the literature, they note that previous research comparing computerized administration with other methods of test administration had used only university students. Using a repeated-measures, counterbalanced design they obtained test-retest coefficients paralleling those obtained for manually administered tests. While the examination of a clinical population was an important step forward, this study suffered from the short-comings of a small sample size and weak design. The authors conclude, "Further comparisons of computer and manual test formats are essential before automated testing is equated with traditional approaches. ...further exploration of affective reactions and attitudes to this approach is required with more rigorously defined patient samples" (p. 588-587).

A recent, but yet unpublished, study appears to have met some of these research needs. Rozensky, Honor, Tovian, and Herz (Note 2) used a heterogeneous clinical sample and more powerful random-assignment experimental design to compare computer and paper-and-pencil administration of the MMPI. They also included an attitude measure. While the design of their study was superior to previous research, their sample size was relatively small ($\underline{N}$ = 51). Reportedly, they failed to observe a difference between the methods of administration.

In regards to subject attitudes, Rozensky et al. (Note 2) found that those receiving the MMPI by computer and those receiving by conventional administration did not differ on level of interpersonal comfort, concern about disposition of results, concern about test accuracy, or displeasure with the experience. However, the computer group was found to rate the experience as less anxiety producing and less time consuming. The authors concluded, "These results suggest that patients' affective responses to automated test administration enhance rather than detract from the use of this cost-effective, valid and reliable tool" (p. 8). These results are similar to those of Skinner and Allen (1983). While Skinner and Allen did not find that a computerized interview of alcohol and drug use influenced the quality of the information obtained from clients, it did influence the clients' perceptions of the assessment process. Specifically, the computerized interview was rated as less friendly, but shorter, more relaxing, lighter, more interesting, and faster than both face-to-face and paper-and-pencil formats.

The findings of Rozensky et al. (Note 2) and Skinner and Allen (1983) contrast with previous research suggesting that computerized administration can be detrimental to some subjects' performance. In the area of ability measurement, computerized assessment was shown to have detrimental effects on low ability subjects (Johnson, & Baker, 1973). Using Rotter's Internal-External Locus of Control Scale and Crown and Marlowe's Social Desirability Scale, Rezmovic (1977) noted

that on these personality measures the computer did not appear to influence all subjects equally. He found that the computer tended to make extreme subjects respond even more extremely. The studies of Johnson and Baker (1973) and Rezmovic (1977) both suggest that, in a clinical population, diagnosis may interact with computerized administration of psychological measures. In fact, Rozensky et al. (Note 2) recommend further research with clinical subjects to determine the interaction of diagnostic types and their emotional and attitudinal reaction to computer-administered testing.

In summary, the automated and computerized methods of administering psychological tests have been shown by most studies to be generally as valid and reliable as conventional administration. However, except for the unpublished work of Rozensky et al. (Note 2), studies exploring this area have been methodologically weak and have only compared test-retest reliabilities. A more robust method would assign subjects randomly to experimental condition. Further, no study has used a clinical population of significant size. Finally, even though some research (Johnson, & Baker, 1973; Rezmovic, 1977) has suggested that the computer does not affect all subjects equally, no study has considered the effects of diagnosis in a clinical sample.

The Future of Computer Administered Measures. The application of the computer to psychological assessment is not only here to stay, but probably "...constitutes the new 'tools of the trade' in mental

health care delivery" (Williams, 1977, p.108). This is especially true with the advent and popularity of powerful and less expensive micro-computers (Johnson, Giannetti, & Williams, 1978; Johnson, & Williams, 1978). While psychological test interpretation has received the most attention (Johnson, Giannetti, & Williams, 1976), attention is also gradually turning to test administration. The use of small computers to administer tests such as the MMPI has the advantages of low-cost, efficiency, and speed of results (Byers, 1981; Elwood, 1972).

As this trend continues, micro-computers will be used increasingly by psychologists to score, interpret, and actually administer many psychological tests. Other interactive applications are also being developed such as computerized supervision of tricyclic antidepressant therapy (Sorrell, Greist, Klein, Johnson, & Harris, 1982), direct computer interviewing of patients to obtain medical and psychiatric histories (Greist & Klein, 1981; Stroebel, 1975), and computer-assisted cognitive-behavior therapy in the treatment of depression (Selmi, Klein, Greist, Johnson, Harris, 1982). There is a striking need to research the effects of direct patient interaction with computers before this practice becomes more widespread. A number of authors have pioneered this effort, but further research is needed which uses clinical populations, takes diagnosis into account, uses a carefully designed experimental approach, has a sufficiently large sample size for psychometric purposes, and examines subjects' reac-

tions to interacting with a computer even if these reactions do not appear to actually affect the subject's responses.

As computer-based psychological testing grows so will the number of comprehensive and automated assessment programs (Evans, Covvey, Gliksman, Csapo, & Heseltine, 1976). Angle, Ellinwood, Hay, Johnson, and Hay (1977) described a computer-based behavioral assessment program which analyzed 26 life areas. They found that "it is favorably received by clients, and in most instances, is preferred to the human interview" (p.747). Another such program is the Psychiatric Assessment Unit (PAU) at Salt Lake Veterans Administration Hospital. The developers of this unit have reported extensively on its characteristics, development, and evaluation (Cole, Johnson, & Williams, 1976; Johnson, & Williams, 1978; Klingler, Johnson, & Williams, 1976; Klingler, Miller, Johnson, & Williams, 1977).

The PAU or "Utah Project" presents self-report psychological measures directly to psychiatric patients through interactive computer terminals. Further, all interviews are structured and computer prompted. The procedure has been kept simple, allows patients time-out periods, and takes into account the possibility of mis-entry or typographical errors (Cole et al., 1976). The Utah Project began with a thorough analysis of the clinical intake decision-making process. The PAU produces a comprehensive patient workup which includes reports of a mental status exam, results of extensive diagnostic psychological

testing, a social and medical history, and a complete physical exam (Klingler et al., 1976).

There is another, somewhat more radical, aspect to the future of computer-based psychological testing. Beyond the simple administration of the standard paper-and-pencil measures now available, new computerized "dynamic" psychological tests can be developed which take advantage of the computer's unique capabilities. These "dynamic" (Giannetti, Klinger, Johnson, & Williams, 1976) or "tailored" (English, Reckase, & Patience, 1977; Patience, 1977; Reckase, 1977) measures would select items from a pool according to the capabilities or characteristics of the subject being tested. This matching process would be dynamic in the sense that it would take place continuously during the actual assessment. This approach has already been attempted with some success with achievement and aptitude assessment (English et al., 1977).

Dynamic computer-based personality measures using branching logic have received little attention since the early work of Kleinmuntz and McLean (1968), who developed a branching short-form of the MMPI, and that of Slack et al. (1966), who used branching logic for an on-line allergy symptom questionnaire. The Psychiatric Assessment Unit (PAU) at Salt Lake Veterans Administration Hospital has also applied a dynamic strategy to a problem-oriented evaluation (Giannetti, Johnson, Williams, & McCusker, 1977). These authors have

strongly encouraged further research into the development of other dynamic psychological measures (Giannetti et al., 1976). Further research and development of dynamic psychometric strategies will enable computer technology to contribute in a new and unique way to the science and art of psychological assessment.

Hypotheses

The review of the literature reveals a number of research issues which the present study attempts to address. First, research using a psychiatric sample is practically nonexistent, although the MMPI is designed primarily for use in a clinical setting. The question of whether an overall difference exists between booklet and computer-based administration methods in a clinical population was addressed by only one investigation (Rozensky et al., Note 2). No study has addressed this question in an inpatient setting. The present work addresses both the questions of profile pattern and overall level differences using a clinical population of psychiatric inpatients.

Second, the interaction of specific diagnoses and the two methods of administration has also not been explored. Previous research has only examined overall differences, despite the suggestion that all subjects are not equally affected by the two methods of administration (Johnson & Baker, 1973; Rezmovic, 1977). The interaction between diagnosis and administration method is examined in the present study and the effects of diagnosis are isolated from those of administration method.

Third, the confounding effect of previous experience with the MMPI booklet version has never been discriminated from the other aspects of the computer-based approach. Those receiving the MMPI for the first time may react quite differently from those who are already familiar with the test, and this could interact with the method of test administration. The effects of previous experience with the MMPI are examined by the present investigation and the effects of this experience are isolated from those of administration method.

Fourth, only one study (Rozensky et al., Note 2) has examined the effects of the two administration methods on subjects' attitudes toward the testing experience. These effects may be independent of the presence or absence of effects on the actual MMPI results. Other research has suggested that subjects' attitudes are generally positive, in favor of the computer-based approach, but again, this question has never been addressed using a psychiatric sample.

Finally, no research has controlled for the potential influence of previous computer experience. Subjects familiar with computers may experience computer-based administration differently from subjects with little or no previous experience with computers.

Specifically, the following hypotheses were made:

1. There will be a significant difference between the patterns and/or levels of the profiles of subjects receiving a computer version of the MMPI and of subjects receiving a standard booklet version (Form R).

2. Diagnosis will interact significantly with the effect of administration method.
3. There will be a significant difference between the profiles of subjects with previous experience with the MMPI booklet version and "naive" subjects. Further, previous experience will interact significantly with method of administration.
4. Subjects receiving a computer version of the MMPI will perceive testing more positively than subjects receiving the booklet version. Specifically, those receiving a computer version will indicate that:
   a) the testing was more enjoyable;
   b) the testing seemed more time-efficient;
   c) the testing situation was more confidential;
   d) the test was more engaging;
   e) the test was easier to take;
   f) they responded to the test more honestly;
   g) the test was less anxiety-inducing.
5. Subjects receiving a computer version of the MMPI who are familiar with computers will perceive testing more positively than subjects receiving the computer version who have no previous experience with computers. The same specific secondary hypotheses were made as in Hypothesis 4.

CHAPTER III

METHOD

Subjects

The subjects in this study were 100 psychiatric inpatients admitted to an urban Veterans Administration Medical Center during a 12 month period. All but four of the subjects were male. Participation was completely voluntary, and 33 patients either declined or were unable to take the test. Age and level of education for all the subjects are reported in Table 1. No significant differences were observed between groups for age, $F(2,130)=2.64$, ns, or level of education, $F(2,130)=1.75$, ns.

Subjects were only assessed when judged stable by ward staff. Usually this was within a few days of admission. This was the standard procedure for all psychological testing and was completely independent from assignment to experimental condition.

Measures

Minnesota Multiphasic Personality Inventory. The MMPI is one of the best known and widely used personality questionnaries. Items are

TABLE 1

Age and Education of Subjects

By Groups

		AGE (years)		EDUCATION (years)	
Group	N	Mean	SD	Mean	SD
BOOKLET	50	37.84	11.67	12.12	2.04
COMPUTER	50	40.94	13.49	13.00	2.30
DECLINED	33	44.57	14.54	12.20	3.46

answered "T," "F," or "?." The booklet version (Form R) demands that the subject respond by blackening the appropriate circle on a machine scorable sheet.

Subjects receiving the computer version also were expected to respond with a "T," "F," or leave an item unanswered. However, they did so by pushing the approprate key on the keyboard of a micro-computer. The items were presented individually by the computer on a television monitor screen (CRT). The computer presented the first five items as "samples" before the actual test began. These were used to demonstrate the use of the computer to the subject. The computer version allowed the subject to correct any responses after pressing "T" or "F" by displaying the item and the subject's response on the screen for about five seconds after the subject pressed "T" or "F." During this period the subject could press "T" or "F" again to change his response. Subjects could skip items by making no response for 45 seconds. The computer would then advance to the next item after informing the subject that the item could be answered later, at the end of the test. Subjects thus had the option of reviewing and answering all items left unanswered before completing the testing session. Any items again left unanswered were scored as "missing" by the computer. The subject was also able to pause during the administration, and could easily resume testing after a break.

In both administration conditions the short form (399 items) of the MMPI was utilized. The short version of the MMPI was felt to be most clinically appropriate for a psychiatric inpatient population and was the version currently in use on the unit before the research project began.

Experiential Measure. The Experiential Measure was constructed by the author to measure seven variables. These were related to the hypotheses that the computer version of the MMPI would be perceived as more enjoyable, more time efficient, more confidential, more engaging, easier to take, more honestly answered, and less anxiety-inducing than the booklet version. The actual measure can be found in Appendix A. It consists of 28 items rated by the subject on a five point scale from "Strongly Agree" to "Strongly Disagree." This rating approach was utilized to allow for finer measurement of the subjects' experiences of the testing than made possible using a simple true/false methodology. Each of the seven variables measured by this survey is comprised of four items. Two items in each group are positively loaded, two are negatively loaded.

Apparatus

The computer version of the MMPI was administered on an Apple II+ Personal Computer. This computer employed 48K of random access memory and two 5.25 inch floppy disk drives. The system utilized a 12-inch, high-resolution, black-and-white monitor. The complete sys-

tem was contained on a portable desk at which the subject could sit comfortably. The desk and computer were brought to a quiet, private office on the inpatient unit. The software employed consisted of a program developed by Psychological Assessment Resources, Incorporated[1] who publish a licensed program which administers and scores the MMPI on the Apple II. The operation of this software was described above.

Procedure

Potential subjects were approached on the wards at a time which did not interfere with any aspect of their treatment. They were informed verbally and in writing of the general nature of the study, the task and time commitment involved, and their right to decline without affecting their treatment. Participation was completely voluntary. They were told that the results of the testing would be placed in their chart, available to their doctor, and subject to the same confidentiality as any other information in their medical record. No identifying information was used with the data employed in the actual research and only group analyses were made.

Based on primary diagnosis at the time of admission, consenting subjects were assigned to one of four diagnostic categories:

1. Psychotic (n = 54)

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[1] This research project was partially supported by a grant from Psychololological Assessment Resources, Inc. Further information about "The MMPI: Computer Version" can be obtained writing to them at P.O. Box 98, Odessa, Florida, 33556.

2. Neurotic (n = 18)

3. Personality Disorder (n = 6)

4. Substance Abuse/Dependence (n = 22)

Patients with a primary diagnosis of organic impairment were not assessed. Categorization by primary diagnosis upon admission was an attempt to define clinically distinct subsamples within the overall sample. Within each of the four categories subjects were randomly assigned to experimental condition (computer version or booklet version).

Subjects receiving the booklet version (Form R) were taken to a quiet, well-ventilated, brightly lit room on the unit. These subjects received the standard instructions described in the MMPI manual (Hathaway, & McKinley, 1951). The first five statements in the booklet were used to establish whether the subject's reading skills were sufficient to understand the content of the items and whether the subject could properly follow the instructions of how to complete the actual test and use the booklet. Subjects receiving the booklet version were told not to leave any items blank. When they completed the MMPI they were given the Experiential Measure (Appendix A). The subjects were simply told to respond to the statements as honestly and accurately as possible.

Subjects receiving the computer version of the MMPI were also taken to a quiet, well-ventilated, and well-lit room on the unit.

These subjects were seated at the computer, briefly instructed in the use of the computer, and then given standard MMPI instructions. The first five items of the test were used as "samples" to establish whether the subject's reading skills were sufficient to understand the content of the items and whether the subject could properly follow the instructions on how to complete the actual test and use the keyboard. Using the demonstration items, subjects were shown how to change answers, pass items, and pause and resume the administration.

If a subject skipped any items, the following message appeared on the screen after item 399 was administered, "Now let's go back over some questions you didn't answer." Skipped items were then presented one at a time. If the subject skipped a item at this point, the item was then scored as missing. After the last item the message, "That's all, thank you" appeared. At this point, the subject was given the Experiential Measure (Appendix A). The subjects were simply told to respond to the statements as honestly and accurately as possible.

After subjects completed the Experiential Measure, all were shown a booklet version of the MMPI and asked whether they had ever taken the test before. Subjects who stated that they had were asked how often and when this testing had occurred. Subjects receiving the computer version were also asked at this time whether they had any previous experience with computers or computer terminals.

CHAPTER IV

RESULTS

The results will be presented in reference to the hypotheses described in Chapter II. In order to test the first three hypotheses, a Three-way Multivariate Analysis of Variance (MANOVA) was performed using the 10 MMPI scales as dependent variables. The three independent variables were administration method, previous experience with the MMPI, and diagnosis. Figure 1 describes how the various terms of the MANOVA were used to test Hypotheses 1, 2, and 3.

Hypothesis 1 proposed that there would be a difference between the pattern or level of the profiles of subjects receiving the computer version of the MMPI and of subjects receiving the booklet version. Table 2 summarizes the results of a MANOVA performed using the MMPI validity scales (L, F, and K) as dependent variables. Table 3 summarizes the results of a MANOVA performed using the 10 MMPI clinical scales as dependent variables. In both analyses the three independent variables were administration method, previous experience with the MMPI, and diagnosis.

SOURCE OF VARIANCE	HYPOTHESIS TESTED
Between Subjects	
Admin Method (M)	Hypothesis 1
Diagnosis (D)	--
Experience (E)	Hypothesis 3
M x D	Hypothesis 2
M x E	Hypothesis 3
D x E	--
M x D x E	--
Error Between	
Within Subjects	
Scales	--
Error Within	

FIGURE 1: The Analysis of the First Three Hypotheses Using a Multivariate Analysis of Variance

TABLE 2

The Effects of Administration Method, Diagnosis, and Experience on the MMPI Validity Scales

SOURCE OF VARIANCE	F	p
Between Subjects		
Admin Method (M)	1.95	0.13
Diagnosis (D)	0.70	0.71
Experience (E)	1.01	0.39
M x D	0.36	0.95
M x E	1.40	0.25
D x E	1.37	0.20
M x D x E	0.26	0.98

TABLE 3

The Effects of Administration Method, Diagnosis, and Experience on the MMPI Clinical Scales

SOURCE OF VARIANCE	F	p
Between Subjects		
Admin Method (M)	2.24	0.02
Diagnosis (D)	1.51	0.05
Experience (E)	0.46	0.91
M x D	0.84	0.70
M x E	1.38	0.21
D x E	1.06	0.38
M x D x E	0.52	0.98

The analysis summarized in Table 3 supports Hypothesis 1, indicating that there was a significant difference between the MMPI results of subjects receiving the computer version and of subjects receiving the booklet version when previous experience with the MMPI and psychiatric diagnosis were taken into account. A MANOVA will detect changes in profile pattern, as well as detect an overall elevation or depression of the scales without a pattern shift. Therefore, Hypothesis 1 was further analyzed for parallelism (pattern shift) and level (elevation shift). The analysis for level did not yield significant results, $F(1,84)=1.11$, ns, suggesting that administration method did not significantly alter the overall elevation of the MMPI clinical scale profiles of the two groups. However, the analysis for parallelism was significant, $F(9,76)=2.52$, $p<.01$, indicating that administration method did significantly alter the pattern or profile of the MMPI clinical scale results. Figure 2 graphically presents the mean MMPI profile results for each administration method.

Table 4 contains the means and standard deviations for each of the MMPI scales broken down by administration method. These were compared using a series of t-tests. The significant difference in MMPI clinical scale patterns between subjects receiving the computer-based administration versus those receiving the booklet administration appears to be due primarily to a significant difference on Scale 8. Subjects receiving the booklet administration scored significantly

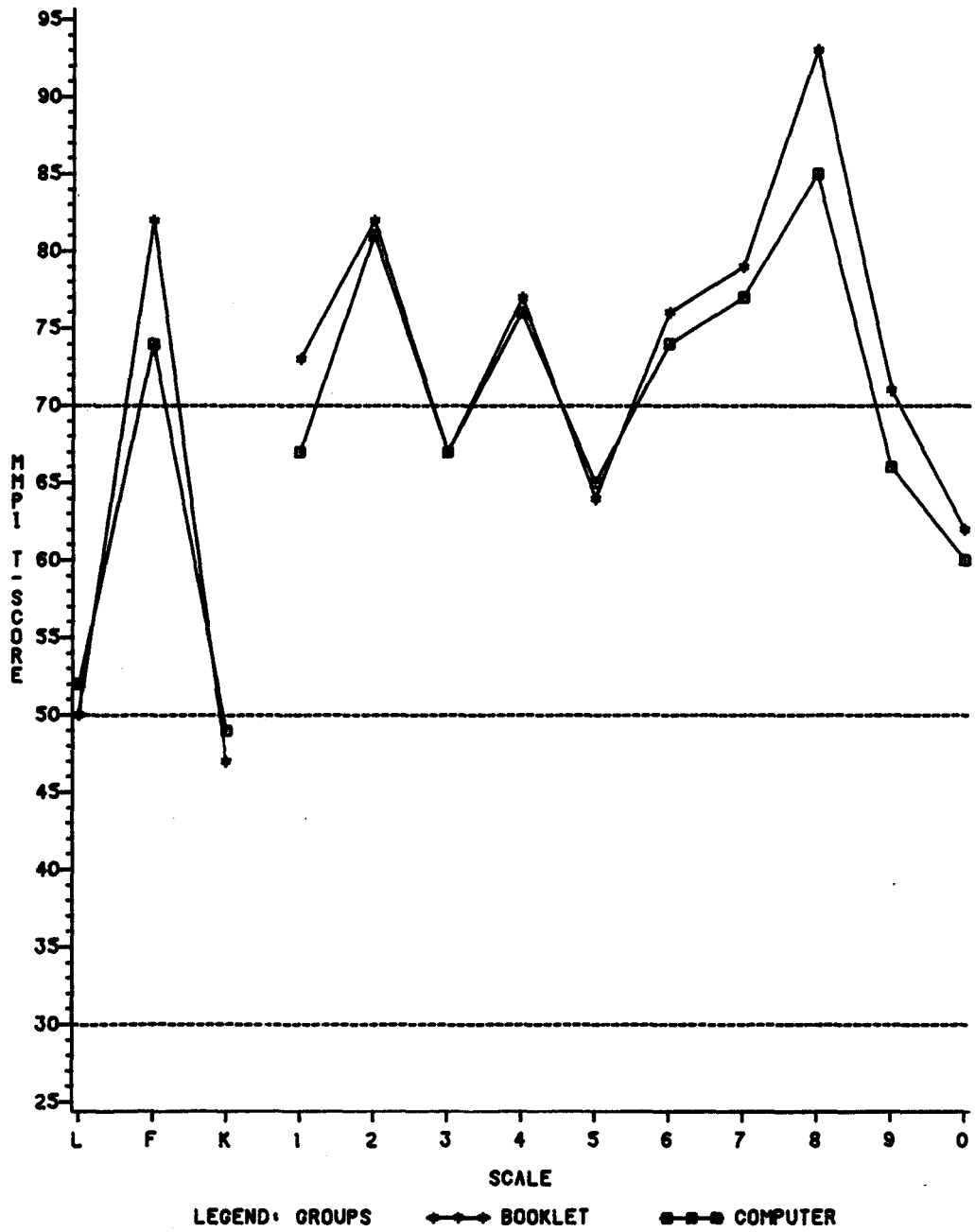

FIGURE 2: Mean MMPI Profiles for Computer versus Booklet Administration Methods

higher on Scale 8, $t(98)=2.09$, $p<.05$, than subjects who received the computer administration. Similarly, subjects receiving the booklet administration also scored significantly higher on Scale F, $t(98)=2.32$, $p<.05$, than subjects who received the computer administration.

Hypothesis 2 proposed that diagnosis would interact significantly with the effect of administration method. This hypothesis was tested by the interaction of administration method and diagnosis (see Table 3) and found not to be supported, $F(30,220.82)=0.84$, ns.

Hypothesis 3 proposed that there would be a significant difference between the profiles of subjects with previous experience with the MMPI booklet version and "naive" subjects. This hypothesis was tested by the main effect of previous experience (see Table 3) and found not to be supported, $F(10,75)=0.46$, ns. Further, Hypothesis 3 also proposed that previous experience would interact significantly with method of administration. This was tested by the interaction of method of administration and previous experience (see Table 3) and also found not to be supported, $F(10,75)=1.38$, ns.

Hypothesis 4 proposed that subjects receiving the computer version of the MMPI would perceive the testing more positively than subjects receiving the booklet version. Seven specific predictions were made regarding enjoyability, time-efficiency, confidentiality,

TABLE 4

The Effect of Administration Method

On Each MMPI Scale

	GROUP					
	Booklet (n = 50)		Computer (n = 50)			
Scale	Mean	SD	Mean	SD	t	p
L	49.88	7.61	51.80	9.04	1.15	0.25
F	81.68	17.15	73.78	16.96	2.32	0.02
K	47.16	8.90	48.52	9.46	0.74	0.46
1	72.86	17.09	67.42	15.53	1.67	0.10
2	82.12	19.40	81.30	18.66	0.22	0.83
3	67.00	12.07	66.98	13.17	0.00	0.99
4	77.10	14.70	75.78	12.35	0.49	0.63
5	63.72	8.24	65.40	10.17	0.91	0.37
6	76.00	18.49	74.34	19.85	0.44	0.67
7	78.96	15.33	77.06	17.37	0.58	0.56
8	93.22	20.26	84.56	21.11	2.09	0.04
9	70.88	13.84	66.42	12.60	1.69	0.10
0	62.42	12.78	59.88	12.03	1.02	0.31

level of attention, ease of testing, honesty of response, and level of anxiety. These predictions were tested primarily by analyzing subjects' responses to the Experiential Measure (Appendix A). The analysis consisted of a comparison of the mean ratings of the two experimental groups for each of the seven factors by means of seven *t*-tests. First, all the negatively worded questions (even numbers) were recoded so that for all questions a "1" indicated a positive response and a "6" indicated a negative response. Next, a mean score was calculated for each of the seven factors. Finally, the seven *t*-tests were performed. Table 5 summarizes the results of these analyses. Those receiving the computer-based administration rated the testing as significantly more enjoyable, $t(98)=3.31$, $p<.01$, significantly more time-efficient, $t(98)=2.69$, $p<.01$, significantly more confidential, $t(98)=2.04$, $p<.05$, and significantly more attention keeping, $t(98)=2.20$, $p<.05$, than those receiving the booklet version. The groups did not differ significantly in their ratings of the ease of testing, $t(98)=1.65$, *ns*, the honesty of their responses, $t(98)=0.67$, *ns*, or level of anxiety, $t(98)=1.11$, *ns*.

A number of other indications of the various attitudes predicted by Hypothesis 4 were also analyzed. In regards to the hypothesis that subjects receiving the computer version would indicate that the testing seemed more time-efficient, actual testing time was analyzed. The booklet administration took an average of 66.43 minutes, while the computer-based administration took an average of 70.80 minutes,

TABLE 5

The Effect of Administration Method

On the Experiential Measure

	GROUP					
	Booklet (n = 50)		Computer (n = 50)			
Factor	Mean	SD	Mean	SD	t	p
Enjoyability	3.47	1.63	2.48	1.33	3.31	0.001
Efficiency	3.60	1.27	2.92	1.23	2.69	0.008
Confidentiality	2.86	1.45	2.29	1.35	2.04	0.04
Attention Level	2.93	1.39	2.38	1.11	2.20	0.03
Ease of Testing	2.76	1.54	2.30	1.05	1.65	0.10
Honesty	2.07	1.50	1.89	0.99	0.67	0.50
Anxiety Level	3.16	1.67	2.81	1.51	1.11	0.27

Note. The closer the mean score is to 1.00, the more positive the response.

$t(94)=0.90$, ns. However, there was significantly less variance ($p<.01$) in the length of administration for the computer-based group ($SD=14.43$) than for the booklet administration group ($SD=30.83$).

In regards to the hypothesis that subjects receiving the computer version would indicate that the testing situation was more confidential, MMPI Scale K, felt to be a measure of defensiveness (Greene, 1980), was also analyzed (see Table 4) but found not to differ significantly between groups, $t(98)=0.74$, ns.

In regards to the hypotheses that subjects receiving the computer version would indicate that the testing was more engaging and easier to take, the mean number of missed items was analyzed. For the computer-based administration group the mean number of missed items was 0.46 compared to 2.96 for booklet administration, $t(98)=2.21$, $p<.05$. Further, 19 of the 50 booklet-administered MMPI's were judged invalid by standard criteria (Scale L > 70 or Scale F > 90 or Scale K > 70 or Missed > 30). Sixteen of the 19 invalid booklet-administered MMPI's were invalid because Scale F was over 90. Of the 50 computer-administered MMPI's 13 were judged invalid by the same criteria. Only 10 were invalid because Scale F was over 90. However, a chi-square analysis failed to reveal a significant difference between the number of valid MMPI's for each group.

In regards to the hypothesis that subjects receiving the computer version would indicate that they responded to the test more

honestly, MMPI Scale L, felt to be inversely related to frankness and honesty (Greene, 1980), was also analyzed (see Table 4), but not found to differ significantly between groups, $t(98)=1.15$, ns.

Hypothesis 5 proposed that subjects receiving the computer version of the MMPI who have previous experience using computers will perceive the testing more positively than subjects receiving the computer version who have no previous experience with computers. Table 6 summarizes the results of 13 t-tests performed on the MMPI scales. Table 7 summarizes the results of seven t-tests performed on the factors of the Experiential Measure. No significant differences between groups were observed for any of MMPI scales or any of the Experiential Measure factors.

TABLE 6

The Effect of Previous Computer Experience

On Each MMPI Scale in the Computer Administration Group

	PREVIOUS COMPUTER EXPERIENCE					
	No Experience (n = 34)		Experience (n = 16)			
Scale	Mean	SD	Mean	SD	t	p
L	52.32	9.69	50.68	7.65	0.59	0.56
F	72.67	16.32	76.13	18.56	0.67	0.51
K	49.68	10.41	46.06	6.70	1.27	0.21
1	65.76	14.60	70.94	17.31	1.10	0.28
2	82.32	17.69	79.13	21.00	0.57	0.58
3	66.12	11.09	68.81	17.05	0.67	0.51
4	74.65	13.46	78.19	9.49	0.94	0.35
5	63.71	9.70	69.00	10.51	1.75	0.09
6	71.12	20.20	81.19	17.76	1.70	0.09
7	76.79	18.70	77.63	14.68	0.14	0.87
8	83.65	22.18	86.50	19.16	0.45	0.66
9	64.18	13.39	71.19	9.42	1.88	0.07
0	60.15	12.60	59.31	11.10	0.22	0.82

TABLE 7

The Effect of Previous Computer Experience

On the Experiential Measure in the Computer Administration Group

	PREVIOUS COMPUTER EXPERIENCE					
	No Experience (n = 34)		Experience (n = 16)			
Factor	Mean	SD	Mean	SD	t	p
Enjoyability	2.37	1.37	2.72	1.25	0.87	0.39
Efficiency	2.86	1.33	3.05	1.01	0.50	0.62
Confidentiality	2.45	1.44	1.94	1.09	1.26	0.21
Attention Level	2.46	1.18	2.19	0.93	0.82	0.42
Ease of Testing	2.38	0.98	2.13	1.19	0.81	0.42
Honesty	1.83	0.97	2.03	1.06	0.66	0.51
Anxiety Level	2.88	1.54	2.64	1.49	0.53	0.60

Note. The closer the mean score is to 1.00, the more positive the response.

CHAPTER V

DISCUSSION

Effects of Computer-based Administration on MMPI Profile

The present study was designed to examine the possible effects of computer-based administration on both the MMPI results themselves and upon the subjective experience of the testing. In this section the effects of computer-based administration on MMPI profile will be discussed, and in the following section the effects on subjective experience of the testing will be examined.

Hypothesis 1 proposed that there would be a difference between the pattern and/or level of the profiles of subjects receiving the computerized administration. Previous research with the MMPI (Rozensky et al., Note 2) failed to observe any difference in the profiles of subjects to whom the test was computer-administered. As a result, when the present research was planned, the investigator was prepared to discuss the strength of the null hypothesis (no difference between administration methods) in terms of the power of the analysis, using a criterion of Beta < .20 (Hays, 1973).

However, the present study did reveal a significant difference between the profiles of subjects who took the MMPI on a computer versus the profiles of subjects who took the conventional Form R booklet version. Specifically, subjects receiving the computer-administered MMPI were found to have significantly lower scores on Scale F and Scale 8 (Schizophrenia). If the results obtained using the booklet form of the MMPI are assumed to represent the norm, computer-based administration of the MMPI appears to "mute" the level of psychological distress and bizarre "psychotic" psychopathology presented by patients on the self-report measure of the MMPI.

Scale F (64 items) was originally constructed to detect unusual or atypical ways of responding to the test items. The items for the scale were selected because less than 10% of an early normative sample responded to them in the scored direction. The scale items ask about bizarre sensations, strange thoughts, peculiar experiences, feelings of isolation and alienation, and unlikely or contradictory beliefs, expectations, and self-descriptions (Dahlstrom, Welsh, & Dahlstrom, 1972). Of the 64 items, 35 are scored only on Scale F. Twenty-one are shared with the psychotic tetrad (Scales 6, 7, 8, and 9). The scale is positively correlated with overall elevation of the clinical scales and particularly with Scale 6 (Paranoia) and Scale 8 (Schizophrenia) (Dahlstrom et al., 1972). In general, Scale F is a rough index of the severity of the psychological distress experienced by a client, with higher scores indicating greater distress, poorer attention, and less adequate reality contact (Greene, 1980).

Scale 8 (Schizophrenia) is made up of 78 items, 15 of which are shared with Scale F. In fact, only 16 items are unique to Scale 8. Scale 8 items assess bizarre thought processes and peculiar perceptions, social alienation, poor familial relationships, difficulties in concentration and impulse control, lack of deep interests, disturbing questions of self-worth and identity, and sexual difficulties (Greene, 1980). High scorers on Scale 8 are not necessarily schizophrenic, but are experiencing severe and prolonged stress accompanied by an acute decompensation. They are also more likely to be undergoing some type of acute psychotic reaction (Greene, 1980).

There are a number of possible reasons why computer-based administration of the MMPI was found to lower scores on Scales F and 8. First, computer-based administration is considerably more structured and controlled than that of the Form R booklet administration. The subject cannot skip around or lose his or her place. Random responses are discouraged, since there is a pause between items and the subject is thus "paced." In Form R the subject can quickly respond and proceed to the next item. In the computer-based administration attention is focused on individual items in a sequential manner, reducing sensory stimulation. All of these factors could aid a subject who is quite distressed and who has problems with concentration and with adequate control of his or her thought processes. The result could be a MMPI profile with significantly lowered scores on Scales F and 8. This explanation is further supported by the results of the experien-

tial questionnaire in which subjects who received the computer-based administration reported that they paid better attention during the testing than those who received the booklet version (see Table 5).

Second, it is possible that the findings of the present study may not have been observed in a less disturbed population. In contrast to previous research, a clinical population of psychiatric inpatients was utilized in the present study. As can be seen from the mean T-scores of each scale for the two administration groups (Table 4), the sample was composed of subjects reporting significant levels of psychological distress. There were high levels of depression (Scale 2), sociopathy (Scale 4), anxiety (Scale 6), paranoia (Scale 7), and schizophrenic symptomology (Scale 8) evident in the overall population means. It is noteworthy that computer-based administration did not significantly lower all of the mean scores. While computer-based administration lowered measures of general distress (Scale F) and of bizarre symptomology (Scale 8), measures of depression (Scale 2), sociopathy (Scale 4), anxiety (Scale 6), and paranoia (Scale 7) were not significantly altered by computer-based administration. It remains for future research to establish whether the pattern of effects observed in this study (lowered scores on Scales F and 8) is also observed in populations with less severe or different overall patterns of psychopathology.

A third explanation for the lowered scores on Scales F and 8 may be related to the research suggesting that computer-based administration encourages subjects to respond with greater honesty than in response to other methods of test administration (Evan & Miller, 1969; Greist, 1975; Greist & Klein, 1980; and Lucas et al., 1977). The implication is that computer-based assessment may yield more accurate results than testing based on traditional administration methods. Most of this research has involved the assessment of drug and alcohol use (Greist, 1975; Lucas et al., 1977). Since subjects tend to underreport use of these substances (Pernanen, 1974) computer-based assessment resulted in admission to a higher level of consumption. In the context of a psychiatric inpatient unit, patients are often felt to be exaggerating their symptomology for various reasons. This is particularly true when services are provided free, on the basis of need, as they are in Veterans Administration Hospital where the present research was conducted. In this setting lowered levels of reported psychopathology (Scale F) and bizarre symptomology (Scale 8) could represent a tendency to respond to computer-based assessment with greater honesty and candor than when tested in a paper-and-pencil format (Form R).

Finally, the findings of the present research, in which an effect for computer-based administration on MMPI profile was observed, contrast those of Rozensky et al., Note 2 who reported no difference between the profiles of psychiatric outpatients receiving a computer-

based MMPI and those receiving the booklet version. The research of Rozensky et al. appears to have lacked an adequate sample size, and thus adequate power, to observe an effect which may actually have been present. A review of their results in light of the findings of the present study revealed non-significant trends in the expected direction for both Scale F and Scale 8.

The most important issue raised by the observation of an effect of administration method upon MMPI profile (Hypothesis 1) is whether computer-based administration produces more or less valid results than the conventional methods of administration. In favor of computer-based administration it could be pointed out that the computer version is similar to the Card Form of the MMPI, since items are presented one at a time. Subjects prone to confusion and sensory overload (i.e., those who tend to score high on Scale 8) may therefore find the computerized administration less difficult to take. Further, computerized administration may cause subjects to respond with greater honesty and candor, as argued above. In fact, subjects receiving the computer version skipped significantly fewer items and, while the difference was not significant, there were fewer invalid protocols produced by computer-based administration. All of these points would tend to argue that computer-based administration is as or more valid than traditional administration methods.

The other side of the validity issue is the argument that any deviation from the existing norms makes test interpretation difficult, if not impossible. Since computer-based administration has been shown to alter MMPI results, it should consequently be avoided, lest the profiles produced be uninterpretable. Such a position appears too extreme in this case. The results of the present study suggest that the influence of computer-based administration is principally on the T-scores for Scales F and 8. While this effect should be taken into account when interpreting computer-administered MMPI's, it does not appear to be so severe as to render existing normative data useless. T-scores for Scales F and 8 were found to be lowered about eight points by computer-administration in an inpatient psychiatric setting. Scores on Scales 1 and 9 were also lowered by about four or five points, but these effects were not significant. Each of these effects could easily be taken into account when interpreting computer-administered inpatient MMPI's. Future research will need to establish whether the effect observed in an inpatient population (with a Scale 8 mean of 88.89 and Scale F mean of 77.73) is also observed in populations with less severe and different patterns of psychopathology.

Hypothesis 2, which stated that there would be a significant interaction between diagnosis and administration method, was not supported (see Table 5). Primary admitting diagnosis (psychotic, neurotic (including non-psychotic affective disorders), personality disorders, and substance abuse/dependence) was not found to interact with

administration method. In other words, the effect of administration method on MMPI scale scores did not differ systematically across diagnostic groups.

The failure to find such a systematic difference is intriguing in light of the previously discussed finding that the main effect found for administration method was principally due to elevation on Scales F and 8. These scales are often thought to be associated with psychotic disorders (Greene, 1980), and one would have expected that this effect would be even more sharply delineated when diagnostic groupings were taken into consideration (e.g., psychotic vs. neurotic). The implication is that the reactivity of Scales F and 8 to computer-based administration is attributable to factors which are more general than psychiatric diagnosis. It also could imply that these are spurious, though significant, results. It is important that this possibility be explored through replication of the present research, and further studies using populations in other settings and with different MMPI profiles.

One could argue that the failure to observe an interaction between diagnosis and administration method was due to the questionable reliability of admitting diagnosis and to the crudeness of a nomenclature utilizing only four categories. This argument is weakened by the finding of a significant main effect for diagnosis (see Table 5) which indicates that the categories were characterized by

different profiles on the MMPI. Although this main effect lends credibility to the diagnostic categorizations employed, it would be helpful if further research re-examined the question of a diagnosis x administration method interaction using discharge diagnoses and finer diagnostic categorizations. A test-retest design (counterbalancing for administration method) could be used to further understand the possible role of diagnosis in subject reaction to administration method.

Previous experience with the MMPI was not found to affect MMPI results or to interact with the method of administration (Hypothesis 3). This suggests that subjects who had already taken the MMPI in another form did not respond differentially to computer-based administration. This might have been demonstrated if subjects with previous experience were more aware of and therefore more influenced by the novelty of computer-based administration. Previous experience with the MMPI does not appear to be an important consideration in understanding the effects of computer-based administration.

Of those subjects receiving the computer-based administration, approximately one-third indicated that they had previous experience with computers. Previous experience with computers did not appear to be related to MMPI profile (Hypothesis 5, see Table 6) or to the subjects' perceptions of the test (see Table 7). This might have been demonstrated if subjects with previous computer experience had been

more comfortable with the computer-based administration than those with no previous computer experience and if this had affected their responses to the MMPI. Previous computer experience does not appear to be an important consideration in understanding the effects of computer-based administration.

In summary, computer-based administration of the MMPI in an inpatient setting was found to significantly lower scores on Scales F and 8. Various explanations for this finding were discussed, including the highly structured nature of computer-based administration and characteristics of the population employed in the present research. The implications for the validity of profiles obtained through computer-based administration were explored and suggestions were made regarding the interpretation of these profiles. There appears to be no evidence that diagnosis, previous experience with the MMPI, or previous experience with computers alters the results obtained when the test is administered by computer. This has generally positive implications for computer-based administration of the MMPI. Future research will need to continue to explore the effects of computer-based administration on MMPI results and possible interactions with other variables and populations.

Effects upon Subjective Experience of the MMPI

As mentioned earlier, the present research addressed two aspects of the possible influence of computer-based administration on the

MMPI. The first is the effect upon the MMPI test results themselves which was discussed in the previous section. This section discusses the effects of computer-based administration upon the subject's perceptions and experience of the MMPI.

Hypothesis 4 proposed that subjects receiving the computer version of the MMPI would perceive the testing more positively than subjects receiving the booklet version. Seven specific predictions were made regarding the subjects' perception of the testing as enjoyable, time-efficient, confidential, attention-keeping, easy to complete, conducive to honesty of response, and anxiety-inducing. These predictions were tested primarily by analyzing subjects' responses to the Experiential Measure (Appendix A). Those receiving the computer-based administration were found to rate the testing as significantly more enjoyable, more time-efficient, more confidential, and more attention-keeping than those receiving the booklet version. The groups did not differ significantly in their ratings of the ease of testing, the honesty of their responses, or their level of anxiety.

An intriguing pattern of results was observed in regards to the subjects' perceptions that computer-based administration was more time-efficient. In fact, the actual mean testing time for the computer group was slightly longer than for the booklet group. However, there was significantly less variance in the length of administration for the computer-based group versus the booklet group. The computer

appears to have "paced" subjects and thus reducing variance in length of testing while increasing the experience of "efficiency."

While it is generally felt that computer-based assessment is well received by clients (Angle et al., 1977), only Rozensky et al. (Note 2) had examined the effects of computer administration of the MMPI on subjects' attitudes toward the testing experience. They found that subjects receiving the MMPI by computer rated the experience as less anxiety-producing and less time-consuming. They did not observe a difference on level of interpersonal comfort, concern about the disposition of results, concern about test accuracy, or displeasure with the experience. Skinner and Allen (1983) found that while a computer-based interview of alcohol and drug use was rated as less friendly, it was also felt to be shorter, more relaxing, lighter, more interesting, and faster than either face-to-face interviews or paper-and-pencil questionnaires.

The clear implication of the results of the present study is that there are significant advantages to administering the MMPI by computer as far as the subject's attitudes towards and experiences of testing is concerned. Further, failure to observe significant differences for ratings of ease of testing, honesty of response, and anxiety level suggests that there are few undesirable experiential effects. Positive experiential effects could be of particular importance to those who use the MMPI in settings where good rapport is essential

(e.g., in the context of psychotherapy, initial assessments, private practice, and consultation to business). The findings of previous studies in this area are generally positive, but somewhat inconsistent. Future research needs to continue to assess the influence of computer-based administration in settings other than inpatient psychiatry and with tests other than the MMPI.

CHAPTER VI

SUMMARY

Although there are a number of computer-administered versions of the MMPI and other popular psychological tests available today, little research has carefully evaluated the possible effects of computer-based administration upon both actual MMPI results and upon subjective experience of the test. Both aspects of the possible effects of administering the MMPI by computer were addressed by the present study.

Computer-based administration of the MMPI was found to affect both MMPI profile and subjective experience of the MMPI in an inpatient psychiatric setting. Specifically, administration of the MMPI by computer was found to significantly lower scores on Scales F and 8. Mean T-scores for both scales were lowered by approximately eight points. Various explanations for this finding were discussed, including the highly structured nature of computer-based administration and characteristics of the population employed in the present research. The implications for the validity of profiles obtained through computer-based administration were explored and suggestions were made regarding the interpretation of these profiles. There appears to be

no evidence that diagnosis, previous experience with the MMPI, or previous experience with computers alters the results obtained when the test is administered by computer. This has generally positive implications for computer-based administration of the MMPI. Future research will need to continue to explore the effects of computer-based administration on MMPI results and possible interactions with other variables and populations.

In regards to the effects of computer-based administration upon the individual's perceptions and experience of the MMPI, those receiving the computer version were found to rate the testing as significantly more enjoyable, more time-efficient, more confidential, and more attention-keeping than those receiving the booklet version. The groups did not differ significantly in their ratings of the ease of testing, the honesty of their responses, or their level of anxiety.

The clear implication of the results of the present study is that there are significant advantages to administering the MMPI by computer, as far as the subject's attitude towards and experience of testing is concerned. The failure to observe significant differences for ratings of ease of testing, honesty of response, and anxiety level suggests that there are few undesirable experiential effects. This finding could be of particular importance to those who use the MMPI in settings where good rapport is essential (e.g., in the context of psychotherapy, initial assessments, private practice, and consultation to

business). Future research needs to continue to assess the influence of computer-based administration in settings other than inpatient psychiatry and with tests other than the MMPI.

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APPENDIX A

EXPERIENTIAL MEASURE

The Experiential Measure is reproduced on the following pages. Each statement is followed by a code here in the appendix that did not appear on the actual test. These codes indicate which secondary hypothesis under Hypothesis 4 the item was designed to test and whether the item was loaded positively or negatively. For example, the code (a-) would indicate that the item was designed to test hypothesis 4a and was loaded negatively.

FOLLOWUP SURVEY

Please respond to the following statements as honestly and accurately as you can. For each statement you are asked to circle a number from 1 to 6:

1. I strongly agree with this statement.
2. I moderately agree with this statement.
3. I mildly agree with this statement.
4. I mildly disagree with this statement.
5. I moderately disagree with this statement.
6. I strongly disagree with this statement.

1) I enjoyed taking this test. (a+)

1 2 3 4 5 6

2) This test took a long time. (b-)

1 2 3 4 5 6

3) I feel that my answers will be kept confidential. (c+)

1 2 3 4 5 6

4) Taking this test was boring. (d-)

1 2 3 4 5 6

5) This test was easy to take. (e+)

1 2 3 4 5 6

6) Sometimes I was not totally truthful on this test.(f-)

1 2 3 4 5 6

7) I felt at ease while taking this test. (g+)

1 2 3 4 5 6

8) I did not like taking this test. (a-)

1 2 3 4 5 6

9) This test was no longer than was necessary. (b+)

1 2 3 4 5 6

10) My answers may not be kept private. (c-)

1 2 3 4 5 6

11) This test kept my attention. (d+)

1 2 3 4 5 6

12) I found taking this test confusing. (e-)

1 2 3 4 5 6

13) I answered the questions on the test honestly. (f+)

1 2 3 4 5 6

14) I was anxious while taking this test.(g-)

1 2 3 4 5 6

15) Taking this test was fun. (a+)

1 2 3 4 5 6

16) This test could have been shorter. (b-)

1 2 3 4 5 6

17) My test results will be kept private. (c+)

1 2 3 4 5 6

18) Sometimes I lost my concentration while taking this test. (d-)

1 2 3 4 5 6

19) The test instructions were very clear. (e+)

1 2 3 4 5 6

20) I did not always tell the whole truth when I took this test. (f-)

1 2 3 4 5 6

21) Taking this test did not make me feel nervous. (g+)

1 2 3 4 5 6

22) I would not want to take a test like this again. (a-)

1 2 3 4 5 6

23) The testing went reasonably quickly. (b+)

1 2 3 4 5 6

24) I am concerned about the confidentiality of this test. (c-)

1 2 3 4 5 6

25) I really paid attention while taking this test. (d+)

1 2 3 4 5 6

26) I sometimes was confused while taking this test. (e-)

1 2 3 4 5 6

27) I told the truth on this test. (f+)

1 2 3 4 5 6

28) Taking this test made me feel tense. (g-)

1 2 3 4 5 6

APPROVAL SHEET

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The final copies have been examined by the Director of this dissertation and the signature which appears below verifies the fact that the disssertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

11/30/84
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