




8-1-1965

The MMPI as a Predictor of Success Among Seminary Students

Sue Webb Cardwell

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THE MMPI AS A PREDICTOR OF SUCCESS AMONG
SEMINARY STUDENTS

A Thesis

Presented to

The Faculty of the School of Education

Butler University

In Partial Fulfillment
of the Requirements for the Degree
Specialist in Education

by

Sue Webb Cardwell

August 1965

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

Since World War II there has been a rapidly growing interest in the psychological testing of seminary students, brought about by increasing concern for both the quality and quantity of clergymen needed in this period of extensive population growth. The accelerating rise in the number needed is complicated by the ever more complex task of the minister as he adds to his roles of preacher, teacher, administrator, pastor, and counselor. The increased use of psychological testing, in general, has been noticed by those charged with the recruitment and guidance of ministerial candidates, and they have looked to a technique found useful in other fields for help in their task.

I. THE PROBLEM

The problem in using existing psychological tests with seminary students is two-fold. First, are there ways in which clergymen differ from non-clergymen that can be identified by the test? Are the general norms applicable to clergymen, or should special norms be taken into consideration in

the interpretation of the test results? Second, are there variables in the test which can differentiate between the effective and the ineffective minister?

Purpose of the study. Since the Minnesota Multiphasic Personality Inventory is the psychological test that is most widely used in seminaries in the United States, it was the purpose of this study (1) to establish norms for Christian Theological Seminary that could be compared with general norms and with the norms of two other studies, those of United Presbyterian and Southern California School of Theology seminarians, to help answer the question of how clergymen differ from non-clergymen and whether special norms need to be taken into consideration in the interpretation of MMPI protocols with seminary students; and (2) to see whether there are variables measured by the MMPI which can differentiate between effective and ineffective ministers and/or predict ministerial effectiveness as measured by (a) academic success as shown by grade point average for two semesters of seminary work, (b) ratings by the faculty and (c) ratings by fellow students, both using the Ministerial Effectiveness Rating Scale.

Importance of the study. The problem of selection and

guidance of the ministry is a crucial one for the church, and one that is neither new nor newly recognized. Two quotations from other centuries sound as timely today as then:

Synod of Philadelphia, 1723: "Though we are satisfied as to his piety and Godly life, yet we think he wants necessary qualifications required in the Word of God for a gospel minister, and therefore advise him to continue in the vocation wherein he is called and endeavor to be useful as a private Christian."

General Assembly 1839: "The General Assembly feels it to be of unspeakable importance, that weak, ignorant, and imprudent men should not be introduced into the ministry. Such men, tho' incapable of doing much good even if pious, yet may do immense mischief to the cause of true religion, and only serve to bring the holy ministry into contempt, a result against which we are repeatedly admonished in the sacred Scriptures. It is not enough to increase the number of the clergy. The church's wants cannot be supplied by merely multiplying the number of ministers, unless they are well qualified for the duties of the sacred office. Indeed, the greater the number of unsound, or ignorant ministers, the greater the injury to the church."¹

Furthermore, from the viewpoint of the ministerial student himself, it is of vital importance that any weaknesses and limitations be recognized early and proper steps be taken to overcome them. If he should be a really unsuitable candidate for the ministry, he needs to be guided into other areas

¹Clifford E. Davis, Guide for Counseling Prospective Church Workers, General Procedures (Pittsburgh, Board of Christian Education, United Presbyterian Church U.S.A., 1964), p. 3.

of work before spending several years of preparation for a career in which he can only find failure.

It is in order to accomplish this double task of serving the needs of the church and of the ministerial candidate that the seminaries have turned to psychological testing as one among several useful tools, to be used along with grades, interviews, and recommendations. Each one of these has its strengths and weaknesses, and any one or two alone are not sufficient. Indeed, it was the recognition of the inadequacy of the last three that led to the development and use of psychological tests. These tests, in their turn, also have their limitations, and probably should never be used as the sole basis for accepting or rejecting a student.² This fact must be recognized so the tests will not be misused. It is in part the improper use of psychological tests that has led to the present widespread criticism of them.³ So it is very important to know as clearly

²Robert C. Nichols and John L. Holland, "The Selection of High Aptitude High School Graduates for Maximum Achievement in College," Personnel and Guidance Journal, XLIII, (September, 1964), pp. 33-40; A Description of the College Board Scholastic Aptitude Test (Princeton, N. J., College Entrance Examination Board, 1963), p. 5.

³James R. Barclay, "The Attack on Testing and Counseling," Personnel and Guidance Journal, XLIII, (September, 1964), pp. 6-16.

and definitely as possible just what each can and cannot do. Anything that can contribute to that end is important.

At the time that this study was undertaken, Christian Theological Seminary was using as its entrance battery of tests, under the supervision of the Bureau of Clinical Services of Butler University, the California Test of Mental Maturity, Short Form, 1957; the Guilford-Zimmerman Temperament Survey; the Kuder Preference Record, Form C; the Conservatism-Radicalism Opinionnaire, Form J; and the Theological School Inventory. The Minnesota Multiphasic Personality Inventory was administered individually as special need for its use was felt in counseling.

In 1962-63, Dr. Duane Spiers was in the process of studying the predictive validity of this entrance battery, using as criterion measures of ministerial effectiveness grade point averages, peer ratings, faculty ratings, and ratings by leaders in the churches served by the students involved. Knowing that the MMPI is used by more seminaries than any other psychological test with general norms,⁴ it was felt that a study of its effectiveness using the same procedures and therefore directly comparable, would be very valuable, both in making decisions as to what tests to use for most efficiency and for sharpening the

⁴Ministry Studies Board Newsletter, April, 1962.

effectiveness of its use in counseling.

The MMPI was originally developed in a psychiatric setting for diagnostic screening and is widely used as a measure of "mental health." It is generally agreed that a certain level of mental health is necessary for effective functioning in the ministry.⁵ This study does not question the usefulness of the MMPI in indicating any student who may be seriously disturbed and so referred for psychiatric examination, or in indicating those less seriously disturbed who are in need of counseling to lessen their psychological discomfort and to enable them to function more efficiently. This usefulness is sufficient to justify its inclusion in the entrance battery of tests given by a seminary.

However, the scales of the MMPI have been found to have meaning within the normal range as well. Dependable relationships have been shown to exist between demonstrated differences in normal groups and certain scales.⁶

⁵James Dittes, "Research on Clergymen," Religious Education, 57, 1962, Research Supplement, p. 143.

⁶George Schlager Welsh and W. Grant Dahlstrom, Basic Readings on the MMPI in Psychology and Medicine (Minneapolis, University of Minnesota Press, 1963), p. 561.

The Handbook⁷ gives personality characteristics found associated with various levels of the clinical and validity scales, taken separately and in certain combinations, in medical, psychiatric, and college settings. The usefulness of the MMPI in counseling with normal populations in college settings has been greatly extended by the findings reported in An MMPI Codebook for Counselors.⁸

The MMPI pool of 550 items has lent itself to the development of over 200 other scales, eleven of which are now routinely scored by some scoring services. Others are widely used in specialized situations. Some thirty-four of these have been chosen by Dr. Clifford E. Davis, Church Occupations Counselor for the United Presbyterian Church, as promising for use in counseling with seminary students, and included in normative studies just completed and published in 1964.

The application of a test valid for one population to a different type of group often leads to serious errors of interpretation. An earlier study by Bier of Catholic seminarians

⁷Dahlstrom and Welsh, An MMPI Handbook (Minneapolis, University of Minnesota Press, 1960)

⁸L. E. Drake and E. R. Oetting, An MMPI Code book for Counselors (Minneapolis, University of Minnesota Press, 1959)

had shown that their mean profile on the MMPI was significantly different from the mean of the general population. They scored above the mean of the population on all nine of the scales (Si was not included), and significantly so at the .01 level on six of these.⁹ So Bier recommends the use of modified norms as the minimum requirement for use of the MMPI with this group. "A certain elevation of the MMPI profile would be accepted as normal for this group, and individual interpretation made upon this basis."¹⁰

Davis found similar results in his study of Presbyterian Seminary students,¹¹ and Fielder reports a mean profile for students at Southern California School of Theology that shows the same tendencies.¹² A more detailed comparison will be made

⁹W. C. Bier, "A Comparative Study of a Seminary Group and Four Other Groups on the MMPI," reprinted in Basic Readings on the MMPI in Psychology and Medicine, (Minneapolis, University of Minnesota Press, 1963), pp. 497-98.

¹⁰Ibid., p. 606.

¹¹Davis, op. cit., Supplement II, p. 21.

¹²Daniel W. Fielder, "A Nomothetic Study of the Southern California School of Theology Seminarian" (Unpublished Doctor's thesis, Southern California School of Theology, 1964), pp. 73-87.

later in this paper, but it was felt that data from other geographical regions and other denominations were needed to indicate whether these norms are generally applicable to Protestant clergymen, or whether local seminary norms are needed for the specific seminary. The possibility that the data from several seminaries could be pooled to form more inclusive norms for Protestant seminary students was envisaged, and could be an important result of the study.

Hypotheses of the Study. It was hypothesized that the same type of profile pattern found in the United Presbyterian and Southern California School of Theology normative studies of Protestant seminary students would be found in norms developed for students at Christian Theological Seminary, making imperative a consideration of this pattern in counseling with them, and that it would not be sufficiently different from the others to make the use of local norms necessary.

It was further hypothesized that some of the clinical, research, and experimental scales of the MMPI would be highly enough correlated with ministerial effectiveness as measured by academic success, peer and faculty ratings, to have predictive validity; that regression equations could be calculated which could predict at a significant level the grade

point average, and the peer and faculty ratings on the Ministerial Effectiveness Rating Scale for the student, using his raw scores on the appropriate scales of the MMPI.

The Christian Churches (Disciples of Christ) require graduation from seminary before ordination to the ministry, and the Methodist Church requires successful completion of half the seminary course before ordination as a Deacon, and graduation plus two years of successful experience in the pastorate before ordination as an Elder and admission to the Conference. Academic success is then a prerequisite for becoming a minister. Therefore grade point average was included as one of the criterion measures. It has long been known that intelligence is a prerequisite for good grades and is highly correlated with academic success. But other variables enter in to account for the differences in achievement shown by students of similar intelligence. It was hypothesized that the MMPI might measure some of the personality variables involved.

Personality enters decisively into effectiveness in any vocation dealing with people, so one might expect a test of personality to contain variables which might correlate with effectiveness in such a vocation. With the MMPI, granted that a certain level of mental health is necessary, it remained a

question whether any of the scales within normal range might have sufficient linear correlation with judges' ratings of effectiveness in the ministry to be able to predict such ratings from raw scores on those scales.

II. DEFINITIONS OF TERMS USED

Ministerial effectiveness. Unfortunately, the question of an adequate definition of ministerial effectiveness is as yet an unresolved one.¹³ The different roles involved in the functions of the minister require different characteristics, so a man may be adequate or better as a pastor, for example, and less than adequate as an administrator. For the purpose of this study, ministerial effectiveness is defined as (1) adequate academic achievement, and (2) being rated as effective by fellow students and faculty members on the Ministerial Effectiveness Rating Scale.

Grade Point Average. Grades at Christian Theological Seminary are letter grades, but for grade point average each is assigned a numerical value: A = four, B = three, C = two, D = one, and F = zero. The grade point average is calculated

¹³Dittes, op. cit., pp. 142-44.

by finding the sum of the products of the numerical value of the letter grade multiplied by the number of hours credit for the course, then dividing by the total number of hours credit. This quotient, carried to two decimal places, is what is called grade point average, or GPA.

III. LIMITATIONS OF THE STUDY

The study is limited by the limitations of the MMPI itself. Like other self-report instruments, the MMPI is influenced by the ability of the person to understand himself and by his willingness to respond honestly. With seminary students one can assume the ability to understand the questions, and with many, indeed, the ability to understand the nature of some of the questions and to respond in such a way as to give a favorable or unfavorable picture of himself. Fortunately, the MMPI contains the validity scales, which give some measure of test-taking attitude and so afford a rough check on the validity of the resulting profiles.

Another limitation is that the multiple regression and correlation analyses are with the various scales of the MMPI taken discretely, whereas personality is too complex for measurement by single scales. English and English define personality as the "pattern of motivation and of temperamental

or emotional traits of the individual (in contrast to cognitive traits and ability)" and "the dynamic organization within the individual of those psychophysical systems that determine his unique adjustment to his environment. (G. Allport)"¹⁴ Long experience with the MMPI has led to increasing use of profile patterns, leading to the publication of "Codebooks" for help in the interpretation of some of the more frequently found complex patterns.¹⁵ Later studies may find certain patterns to be more valid predictors than these scales taken singly.

It should, of course, be kept in mind that the MMPI was not designed to predict grades or ministerial effectiveness as measured by peer and faculty ratings, but to do so would be an extension of its usefulness.

The matter of criterion measures of ministerial effectiveness is a thorny question which has plagued research in this field, and must be recognized as a limitation of this study. Dittes, indeed, raises the question as to whether faculty and peer ratings based on observations made in the seminary com-

¹⁴Horace B. English and Ava Champney English, A Comprehensive Dictionary of Psychological and Psychoanalytical Terms, (New York, Longmans, Green and Co., 1958), p. 382.

¹⁵Drake and Oetting, op. cit., pp. 10-11.

munity, are not rather themselves predictor variables, "based on a large and unchecked theory held by the raters as to what makes an effective clergyman."¹⁶ Admittedly, the faculty raters had to call on their own past experiences and intuition in trying to rate the students involved in the study on the Ministerial Effectiveness Rating Scale. Student ratings were often made on the basis of acquaintance at the seminary, in car pools, and in general, rather than on the basis of observation in their parishes. Furthermore, ratings made for the Spiers study by leaders of the churches which the students served as pastors "had a 'halo effect' and thus a restricted range. This was even more evident in the field work ratings received for the crossvalidation group. In some cases comments were written on the form that the raters didn't want to mark their student minister down in any area because they had not known him long enough. The ratings were not very discriminating and did not distinguish sharply between the better or poorer performing student ministers."¹⁷ So the church evalua-

¹⁶Dittes, op. cit., p. 158.

¹⁷Duane E. Spiers, "A Study of the Predictive Validity of a Test Battery Administered to Theological Students," (unpublished Doctor's Thesis, Purdue University, West Lafayette, 1965), pp. 109-10.

tion ratings were not included in this study. However, after all his criticism, Dittes suggests for the measurement of the criterion, "Ratings or nominations or reports of behavior can be obtained from laymen, colleagues and peers, supervisors and church superiors, theological faculties and from clergymen themselves, or by independent observers."¹⁸ So he himself suggests nothing better.

The question of whether these ratings should be along a single good-bad continuum, or along several dimensions of the criteria has not been settled. Do different variables enter into being an effective pastor, an effective administrator, and an effective preacher? Should several scales be used for rating the various aspects of the minister's functioning? One study has seemed to indicate that halo effect, in that raters tend to rate a person high or low on all or most items without much discrimination, operates to such an extent that a global rating is preferable,¹⁹ so the ratings on the different items of the MERS have been averaged to give one over-all score for a global rating.

The validity of the Ministerial Effectiveness Rating Scale is "face validity," based on its content and manner of

¹⁸Dittes, op. cit., p. 161. ¹⁹Ibid., p. 157.

construction. Spiers has suggested that the MERS needs further refinement if it is to be used in later studies, since the raters themselves narrowed the ten-point scale on each item to about five points, and that factor analysis might reduce the number of items rated from the seventeen presently included.²⁰

The literature related to the problem will be reviewed in the next chapter. The plan and methodology of the study will be described in Chapter III, while the results will be presented in two chapters, norms in Chapter IV, and correlations, regression equations and crossvalidation in Chapter V. A summary, conclusions, and suggestions for further research will be given in Chapter VI.

²⁰Spiers, op. cit., p. 6.

CHAPTER II

REVIEW OF THE LITERATURE

A vast amount of research has been done on the Minnesota Multiphasic Personality Inventory, most of which is beyond the purview of this study. In this chapter that part of it which has to do more specifically with clergymen or seminary students, and which seems more pertinent to this particular study, will be considered. As a background for this, a little of the history of psychological testing in Seminaries seems appropriate.

I. USE OF PSYCHOLOGICAL TESTS IN SEMINARIES

History. Theological schools have been using psychological tests in one form or another since about 1921, according to Billinsky's report to the American Association of Theological Schools in 1956. He felt that little progress had been made for several important reasons :

First of all, testing in our theological schools has been handled by men whose training in psychological measurements and statistics was either very poor or completely absent. Furthermore, many of those men were younger men with limited pastoral experience and lacking realistic interpretation of the ministry. Secondly, the tests that

had been used were standard tests often poorly selected and as far as I know none of these tests were ever validated for the purpose for which they were used in our theological schools. Thirdly, the battery of tests administered to our students was changed so frequently, often for no valid reason, that it became impossible to accumulate correlative data over a long period of time. Fourthly, there has never been made a serious intent to bring together all those who are interested in testing theological students for a series of workshops where the information could have been freely exchanged and correlated. Fifth, there has never been a serious follow-up study of the students tested in our theological schools, in order to discover the validity of our interpretation of our test results or our predictable success or failure and of actual performance of the student, not only in the seminary but also in the pastorate.¹

The first move toward general discussion of the use of tests and the sharing of results was made by the Department of the Ministry of the National Council of Churches in 1954.² A letter was sent to 107 theological schools listed in the 1950 Bulletin of the American Association of Theological Schools asking for information on how they used tests to discover and enlist students, to screen out undesirable or unpromising applicants, and as an aid to counseling. Eighty schools replied, of which fifty-three reported using forty-

¹John M. Billinsky, "Using the Results of Testing," Bulletin of the AATS, 1956, 22, pp. 135-6.

²Elmer G. Million, "Psychological Testing in the Seminaries," Bulletin of the AATS, 1954, 21, pp. 85-96.

six different psychological tests. Twenty other schools recorded an interest in using them. A few seminaries were using them for screening purposes, but most said they were using them for counseling purposes after admission. There were three major patterns of administration and use, where a seminary assumed complete responsibility for developing and administering its testing program, where a partnership existed between a college or university and a seminary, and where a seminary cooperated with a denominational program. Froyd summarized, "Considerable activity, great diversity, rugged individualism, and almost no cross-communication -- these are the general characteristics of the testing program on the seminary level."³

A Consultative Conference under the auspices of the Department of the Ministry of the National Council of Churches in 1955 asked Educational Testing Service of Princeton, New Jersey, to begin a study of testing as related to the ministry, to evaluate tests already in use, and to undertake the development of a test for use with theological students. This was begun in 1956 under the directorship of Frederick R.

³M.C. Froyd, "Pretesting for the Ministry," Christian Century, June 27, 1956, pp. 769-70.

Kling,⁴ and resulted in the Theological School Inventory. It was first used on a trial basis in 1958, then administered in twenty-eight theological schools in 1959 to establish norms. Christian Theological Seminary was one of these twenty-eight. In 1960 it was made available to all theological schools. It is designed to evaluate the strength and type of motivation which attracts persons to the ministry.

A very important outgrowth of this activity was the formation of the Ministry Studies Board in 1960, with the financial support of Lilly Endowment, Inc., of Indianapolis. Four of its eleven trustees are nominated by the Department of Ministry, Vocation, and Pastoral Services of the National Council of Churches, and four by the American Association of Theological Schools. The other three are elected at-large by the trustees, and the eleven represent many different denominations. Harry DeWire became Director in 1960 on a part-time basis, but this year, 1965, a full-time director is being appointed.

That this development has great significance for psychological testing in seminaries is evident from the state-

⁴Frederick R. Kling, "A Study of Testing as Related to the Ministry," Religious Education, 1958, 53, pp. 243-8.

ment of purpose of the Ministry Studies Board, as found in its Prospectus:⁵

To conduct, stimulate, and promote research on any and all matters relative to the improvement of professional leadership in the churches and initiate or sponsor programs of this nature which may be referred to it by the denominations, theological schools, or foundations.

To promote the development of tests and other techniques designed to aid in the identification, guidance, selection, and evaluation of ministerial candidates.

To assist in the collection and dissemination of information bearing on tests and other research techniques used in the guidance, selection, and evaluation of ministerial candidates.

To conduct programs of training and instruction on the use of such tests and techniques.

To consider ways and programs in which tests and techniques can be used in reference to ministerial candidates and where necessary, to execute the same.

As a part of its work, the Ministry Studies Board, in 1961, sent survey forms to 115 accredited and associated seminaries in the American Association of Theological Schools. The statistics on the 108 returns received in time to be reported in the Newsletter, April, 1962, are found in Table I. The figures for the 1954 survey are also included for comparison. Of the 108 reporting, nineteen used no test at all, in

⁵A Prospectus on the Ministry Studies Board, Dayton, Ohio.

TABLE I

PSYCHOLOGICAL TESTING IN THEOLOGICAL SCHOOLS

	1954*	1962**
Total number of seminaries	107	115
Number of reports returned	80	108
Number of schools using tests	53	89
Number of schools using no tests	27	19
Total Number of tests used	46	72
Largest number of tests used by single school	8	11
Number of schools using only one test	10	10
Average number of tests per school	3.3	3.7

*Million, AATS Bulletin, 1954.**MSB Newsletter, April, 1962.

the majority of cases because they knew of no test in which they had sufficient confidence, or had no one trained to carry on a testing program. The eighty-nine schools using tests were using seventy-two different tests: thirty different personality inventories, twenty-five different achievement tests, and seventeen different vocational and interest tests. The thirteen tests used in five or more seminaries, with the number of schools using each, are listed in Table II. It is worthy of note that the MMPI is the one used by the largest number, or fifty-eight percent of the schools using tests. Four other returns were received later, and a mimeographed report in December listed 112 schools, with ninety-two using tests. The Theological School Inventory was listed as being used by fifty-six seminaries.

There was evidence of considerable shift in the choice of tests used from 1954 to 1962. Thirty-two seminaries indicated that they had made changes in their selection of tests during the previous five years. In nearly every case, the test discontinued was replaced by one similar, as the Bernreuter Personality Inventory being replaced by the MMPI. Some of the tests listed as being used are used as part of an entrance battery, while others are used only where special

TABLE II

MOST WIDELY USED TESTS IN 1962*

Test	No. of Schools	Percentage
Minnesota Multiphasic Personality Inventory	52	58%
Strong's Vocational Interest	28	31%
Standard-Objective Rorschach Test	17	19%
Miller Analogies Test	15	17%
Graduate Record	15	17%
Ohio State Psychological (all forms)	14	16%
Guilford-Zimmerman	13	15%
California Mental Maturity	9	10%
Bernreuter Personality Inventory	7	8%
Thematic Apperception Test	7	8%
Allport-Vernon Study of Values	5	6%
Wechsler Adult Intelligence	5	6%
Otis-Hennon-Nelson	5	6%

*MSB Newsletter, April, 1962.

problems or needs arise.

Seventy-two of the eighty-nine schools using tests administered them at or shortly after admission. About sixty percent of the schools indicated that they used them for counseling purposes only. Only nine indicated that they used them solely for screening, and the twenty-seven others used them for both counseling and screening.

While some of the increases may be due to the larger number of seminaries reporting, one can agree with DeWire's observation, "It is apparent that psychological testing has become standard procedure in seminary training."⁶

Attitudes toward testing. Attitudes toward the use of psychological testing have ranged from hostile to tolerant to enthusiastic. In the early years it was often seen as a conflict between the psychological test and the Holy Spirit. If a man was called of God, who could question it? In another vein and spirit, Hiltner in 1957 maintained that psychological tests in unskilled hands are reduced to gadgets; it has not been demonstrated that tests peculiar to their purpose are necessary for ministerial students; if tests are for "screening

⁶Ministry Studies Board Newsletter, April, 1962.

out," why not use general tests; faculty skill in using these tests may be no more valuable than his increased skill in interviewing and related techniques.⁷ To which Saunders replied that it seemed premature to quibble over whether to use special or general tests, and that such techniques as the interview have not been shown to surpass tests in validity.⁸

This type of questioning is not limited to seminaries, however. Barclay, writing in defense of testing in the Personnel and Guidance Journal, September, 1964, has to admit that there are valid deficiencies in present programs.⁹

Others question whether the implications of the "call" mean that "religious vocation" differs from other vocations,¹⁰ and Sweeney, writing on "The Morality of Psychological Testing of Vocations," takes exception to the practice of compulsory

⁷Seward Hiltner, "Psychological tests for Ministerial Candidates," J. Past. Care, 1957, 11, pp. 106-8.

⁸D. R. Saunders and S. C. Webb, "A Reply to Dr. Hiltner," J. Past. Care, 1957, 11, pp. 108-10.

⁹James R. Barclay, "The Attack on Testing and Counseling--An Examination and Reappraisal," The Personnel and Guidance Journal, 1964, 43, pp. 6-16.

¹⁰J. O. Nelson, "Vocation, Theism, and Testing," Pastoral Psychology, 1959, 89, pp. 33-40.

testing.¹¹

In its Prospectus, the Ministry Studies Board still has to say:

There are mixed reactions to the use, relevance, and effectiveness of psychological testing for ministerial candidates. Because the spiritual implications of the profession are considered both valid and basic, there is an understandable resistance to the indiscriminate use of tests. On the other hand, if tests can help in the process of evaluation and guidance and otherwise increase our understanding of the ministry, they should not be discounted.

Among people deeply involved in using psychological tests with ministers, as were those attending the Conference on the Guidance of Ministerial Candidates in Columbus, Ohio, May 10-13, 1965, the question of whether psychological tests should be used for screening, or for counseling only, is still a live issue. There was some feeling that screening out the brilliant misfits would lead to safe mediocrity. That no psychiatrist would have passed St. Paul was mentioned several times. The usual formula seemed to be, "we don't use tests to screen, but to guide." Indeed, a recent intensive follow-up study by Harrower, using intelligence and "positive mental-health potential" as measured by a battery of psychological

¹¹Robert Howard Sweeney, C. S. C., National Catholic Education Association Bulletin, August, 1964.

tests, shows these to be meaningful when compared with excellence of performance in the ministry, but she also says, "On the other hand, it would seem that psychological tests and our concepts of positive mental-health potential give no clue as to which students will voluntarily withdraw, decide on a teaching career in the religious field, enter a different denomination, or leave the ministerial field completely."¹² Davis put it succinctly, "But there is a human factor which cannot be measured, and a divine factor which cannot be ignored."¹³

II. RESEARCH

The amount of research on seminary students has perhaps been in proportion to that on other groups, and is increasing with the impetus of the Ministry Studies Board and the wide use of psychological tests in seminaries. In 1962, thirty-nine of the theological schools surveyed indicated that some

¹²Molly Harrower, "Mental Health Potential and Success in the Ministry," Journal of Religion and Health, Vol. 4, No. 1, October, 1964, p. 58.

¹³Clifford E. Davis in an address to the Conference on Guidance of Ministerial Candidates, Columbus, Ohio, May 12, 1965. Permission to quote secured.

sort of study had been undertaken or was under way, according to the April MSB Newsletter. In about September, 1965, a comprehensive bibliography of more than 700 titles of books, articles, theses, and dissertations pertaining to research on clergymen, produced jointly by the Board of Theological Education of the Lutheran Church in America and the Ministry Studies Board, will be published.¹⁴ The two most recent issues of the Newsletter mentioned several interesting studies presently under way.

Dittes, however, writing in 1962 about research on clergymen, was quite critical of most of the research done to that time. "There has, regrettably, not yet developed from research activities to date any firm set of trustworthy and important conclusions. It appears, after a review of studies in this field, that most research has proceeded to collecting data and drawing conclusions without first solving important methodological problems. Conversely, the research which has most successfully tackled the methodological problems has not yet applied the methodology to a full-blown

¹⁴Robert J. Menges and James E. Dittes, Psychological Studies of Clergymen: Abstracts of Research, Thomas Nelson and Sons, to be published about September 1, 1965.

study. For example, perhaps the single most successful solution to the problem of developing a criterion for effectiveness has been accomplished in a study which has used a total sample of six! (Stern, 1954)"¹⁵ He continues, "If the futility of borrowing secondhand measures from other research problems and other areas of research were not apparent on the a priori grounds just argued, it would quickly become apparent empirically by a survey of research findings actually reported. These conclusions present a discouraging parade of negative results, no relationship between the predictor and criterion measurement--except in such non-surprising instances as when a measure of intelligence proves predictive of seminary grades."¹⁶

He lists three major difficulties with most current research:

Short-cut criteria, in which certain easily available estimates of some kinds of performance are used--the classic example being grade point averages--without any attempt to validate as to whether this is related with

¹⁵ James E. Dittes, "Research on Clergymen," Religious Education, 1962, 57, Research Supplement, pp. 141-2.

¹⁶Ibid., p. 145.

actual performance criteria in the field.

Single dimensional criteria, in which it is assumed that a single good-bad dimension is adequate to account for clergy performance.

Pickup predictors, employed promiscuously because easily available, without any proper introduction into the research by way of theoretical expectations.¹⁷

While admitting the validity of much of his criticism, it might be suggested that a "firm set of trustworthy and important conclusions" in this field are not usually easily arrived at, that readily available variables are the logical ones to begin with before trying for more esoteric ones, and that negative results may contribute to progress, as in trial and error learning, provided they are communicated and taken into account in future research. Indeed, it may be as important to know what a test will not do as to know what it will do. Most importantly, additions to our knowledge in most fields come much more frequently in small increments than in dramatic break-throughs, and these break-throughs are usually preceded by the long, patient building-up of these small increments. With this in mind, some of the research done with the MMPI will be considered, first normative studies, then predictive ones.

¹⁷Ibid., p. 155.

Normative studies. One of the early and most thorough normative studies of the MMPI was done by Bier on Catholic seminarians in 1948.¹⁸ Subjects for the study included 171 seminarians from different geographical regions, 208 medical students, 121 dental students, fifty-five law students, and 369 college students. The groups were equated to be comparable, in that all students were both Catholic and unmarried, and all were of at least college level in education, giving a rough equation of intelligence. Even age was equated statistically by a covariance technique. All groups scored higher than the mean for the general population, and the seminarians the highest of all, making them "the most deviant portion of an already deviant population."¹⁹ Seminarians scored above the mean of the population on all nine of the MMPI scales, and differently from the other groups in six of the nine scales at the .01 level of significance. However, he found that the well-adjusted seminarians differ far more from poorly adjusted sem-

¹⁸W. C. Bier, "A Comparative Study of Five Catholic College Groups on the MMPI," Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, Univ. of Minnesota Press, 1956) pp. 586-609.

¹⁹Ibid., p. 593.

inarians than they do from well-adjusted medical, dental, law and college students. So he concluded, "Psychological adjustment emerges as something basic transcending purely vocational lines...The MMPI will serve as a substantially suitable instrument in the testing of seminary adjustment because it is accomplishing essentially the same thing, giving essentially the same differentiation in the seminary group as it is in the others."²⁰ However, he felt some modification essential, and proceeded to do an item analysis of the first 366 items. He found that "four of the ten items which serve most to differentiate the seminary group from the others are sex items. It is perfectly clear that sex adjustment for the seminarians, dedicated as they are to a life of celibacy, is a very different thing than it is even for the unmarried groups comprising the present study...The seminary group is differentiated from the others because a certain number of items either do not apply to the group at all, or apply in a very different way from that in which they apply to the other groups."²¹ Bier recommended modification of content, and put out a modified form of the MMPI to be used with Catholic seminarians, but felt that a minimum requirement would be modified norms,

²⁰Ibid., p. 595.

²¹Ibid., pp. 604-5.

in which " a certain elevation of the MMPI profile would be accepted as normal for this group, and interpretation made on this basis."²²

In spite of the fact that Goodstein (among others) found the same general differences for male college students and recommended the use of new norms for university screening work, though considering regional or local norms unnecessary,²³ Welsh and Dahlstrom do not agree. They write, "However, the conclusion reached by several of these authors that specialized norms will have to be constructed for these populations is not one with which we would agree. Our interpretation is that there are inferences which can legitimately be made from a specified score value of an MMPI scale regardless of the relative frequency or infrequency of this score value in the group under consideration. A standard normative group forms the only defensible reference for score comparison."²⁴

²²Ibid., p. 606.

²³L. D. Goodstein, "Regional Differences in MMPI Responses among Male College Students," Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, Univ. of Minnesota Press, 1956) pp. 6574-8.

²⁴G. S. Welsh and W. G. Dahlstrom, Basic Readings on the MMPI in Psychology and Medicine. (Minneapolis, Univ. of Minnesota Press, 1956) p. 561.

Extensive work with Protestant seminarians has been done by Clifford E. Davis, of the United Presbyterian Church. Under his direction a denomination-wide program of testing for counseling on three levels has been set up, the local level, the presbytery level, and the seminary level. On the presbytery level, the Strong Vocational Interest Test, the Guilford-Zimmerman Temperament Survey, and the MMPI are administered by a proctor, and returned to the Office of the Church Occupations Counselor for scoring and interpretation. The results are available for admissions committees at the time of seminary application. Used in the seminary itself are various projective tests, reading tests, and some portions of intelligence tests.²⁵ In his Guide for Counseling Prospective Church Workers, with its two supplements, are found seminary norms for the Zulliger Test, the Director of Christian Education scale for the Kuder Preference Record, Vocational Form D, and, in more detail, for the Strong Vocational Interest Blank and the MMPI. For the latter two, norms have also been established for seminary women, and National and Ecumenical Missions Workers, both men and women.

²⁵Clifford E. Davis, Guide for Counseling Prospective Church Workers, (Pittsburgh, Board of Education of the United Presbyterian Church, 1963) p. 8.

Davis uses the usual profile forms for the general population norms, then recommends the use of plastic overlays on which the special norms have been drawn. A comparison of these Presbyterian Seminary Norms and those found for CTS will be made in Chapter IV.

As mentioned in Chapter I, Davis selected thirty-four of the additional scales listed in the Appendix of the Handbook for study purposes, as giving promise of usefulness with church populations, and calls them Auxiliary Scales. These scales are included in the present study, and comparison will be made with the Presbyterian norms. In addition, Davis chose thirty-four sub-scales, taken from the longer D, Hy, Ma, Mf, Pa, Pd, and Sc scales, and included norms and profile forms in his Guide for Counseling Prospective Church Workers. He is studying patterns of success and failure of National and Ecumenical Missions Workers on the Auxiliary scales.

Vayhinger and Wise have made a longitudinal study of students at Garrett Theological Seminary, using the MMPI as part of the study, but the findings are not yet published.²⁶

²⁶John Vayhinger and Carroll Wise, A Psychological Study of Theological Students, to be published.

Jalkanen used a sample of one hundred Lutheran seminarians and compared their mean profile with the established MMPI norms for male college students. He found that the seminarians were significantly higher on Hs, Hy, Pd, Mf, and Pa, and lower on D, but not significantly so.²⁷

Fielder made a normative study of students at Southern California School of Theology, using the tests administered as an entrance battery since the establishment of the school in 1956, that is, the Graduate Record Examination, the Guilford-Zimmerman Temperament Survey, the Strong Vocational Interest Blank, and the Minnesota Multiphasic Personality Inventory. On the MMPI, he also made comparative studies of the mean profiles of married and unmarried students, of dropouts, failures, and the changes from entrance to graduation of one class.²⁸ The norms for the MMPI found in his study will be compared with those found for Christian Theological Seminary students in this study.

²⁷R. J. Jalkenen, "The Personality Structure of Seminarians: The use of Available MMPI norms for Diagnosis." (Unpublished Master's Thesis, Roosevelt University, 1955)

²⁸Daniel W. Fielder, "A Nomothetic Study of the Southern California School of Theology Seminarian." (Unpublished Doctor's Thesis, Southern California School of Theology, 1964)

While more detailed comparison will be made later, generally, considering Catholic and Protestant together, compared with general norms and those of control groups, seminarians have high scores on K, Mf, Hs, Hy, Pt and Sc. Protestants tend to score low on Si, which was not scored for the Catholic groups, and to score higher on Pd and Ma than the Catholics.

A "very general kind of interpretation" is made by Dittes:

Seminarians appear moved by some sensitivity to and awareness of tribulations of the human situation. The Protestants might seem to be a little more active or "freer" in their response. However, an item analysis would be very illuminative. The Ma and Pd scales contain some items which could clearly be interpreted as a restiveness under authority. If it happened that these were the items which were contributing to the high score among Protestants, this might be impressive evidence in favor of one of the theories...Catholic seminarians tend to be lower than Protestant seminarians and lower than other control groups on Pd which can be labeled as unconventionality.²⁹

Predictive Validity Studies. Studies of the predictive validity of the MMPI used with seminary students have been plagued by the yet unresolved question of valid criterion measures of ministerial success. As students, ministerial experience is limited to student churches on a part-time basis.

²⁹Dittes, op. cit., p. 153.

Real measures of effectiveness need to be applied after five to ten years in the full-time ministry, implying an urgent need for follow-up studies. However, as the possible rather than the ideal, measures used have included grade point average, faculty ratings, self ratings, and field work ratings.

Although Dittes says that grade point average is the most used of "short-cut" criteria,³⁰ only one study of the correlations of the scales of the MMPI with academic average, incompletely reported, and one profile analysis with honor point ratio were found. Webb and Goodling made a study of test validity in the Chandler School of Theology using two samples, one of 220 students in their sixth or lower quarter, and the other of 136 entering students in the fall of 1953. The battery included the Ohio State Psychological, the Cooperative English Test, the Cooperative General Culture Test, the Guilford-Zimmerman Temperament Survey, the Strong Vocational Interest Blank, the MMPI, and college grade point average. The criteria used were average grades, grades for selected courses, and ratings of certain written work. The numerical values assigned were A = 40, B = 30, C = 20, D = 10, F = 0.

³⁰Ibid., p. 155.

In general it was found that the average on the required courses had a higher correlation with test scores, using Pearson's r . "For Sample I scores on seventeen scales of the MMPI and ten scales of the Guilford-Zimmerman were correlated with the first year average. Only one scale, Dominance on the MMPI, correlated significantly with the criterion ($r = .14$).³¹ One wishes more information had been given in the report, for more detailed comparison with the correlations found in this study. The seventeen scales of the MMPI used were not named.

Thompson made a study of 140 first year students at three Lutheran seminaries, using the Ohio State Psychological Test, the Strong Vocational Interest Blank, and the MMPI. Criteria measures were honor point ratio and a faculty rating scale. MMPI profile analysis showed lower grade averages for student with elevated profiles than for those with "normal" profiles, at the .05 level of significance.³²

³¹S.C. Webb and R. A. Goodling, "Test Validity in a Methodist Theological School," Educational and Psychological Measurement, 18. (1958) pp. 859-866.

³²J. S. Thompson, "A Study of Relationships Between Certain Measured Psychological Variables and Achievement in the First Year of Theological Seminary Work." (Dissertation Abstracts, Vol. XVI, No.10) pp. 1846-47.

Ratings have often been used, but studies using the MMPI with them are few. Two studies of Catholic seminarians are reported. Hispnicus studied fifty seminarians who were given a battery of tests and rated by faculty as to prospects for success. Significant agreement among judges was found. Those who were on the well-adjusted end of the MMPI scales were rated higher.³³ Wauck used a sample of 207 major seminarians, administering the Ohio State Psychological Test, the Kuder Preference Record, the MMPI, and the Group Rorschach, and having the faculty rate them on adjustment. They were divided into groups on the basis of these ratings. The better adjusted group was higher on Depression and Psychastenia, though both groups were in normal range on all MMPI scales.³⁴

One study of Protestant seminarians using the MMPI and ratings was found, that of Webb and Goodling, a companion study of the one using grade point averages referred to above,

³³M. B. Arnold, P. Hispnicus, C. A. Weisgerber, P. F. D'Arcy, Screening Candidates for the Priesthood and the Religious Life. (Loyola University Press, 1962)

³⁴L. Wauck, "An Investigation into the Use of Psychological Tests as an Aid in the Selection of Candidates of the Diocesan Priesthood." (Doctor's thesis, Loyola University, 1957)

but using field work ratings. The authors prepared a graphic rating scale, scored with a ten interval key, containing eight scales. Six of these were constructed to parallel the content of the corresponding scales of the Guilford-Zimmerman Temperament Survey: Leadership, Emotional Stability, Restraint, Friendliness, Sociability, and Objectivity. Two others, Responsibility and Judgment, were added. Rating was done by the student's field work supervisor, usually a pastor or district superintendent, each student rated by only one person. They found "no significant correlations between selected MMPI scales and selected graphic rating scales."³⁵ Which MMPI scales were "selected", or which graphic rating scales, was not indicated.

A third study in this same series using the same samples, but using faculty ratings, did not use the MMPI. However, it is unusual in that faculty members rated students on four traits, intelligence, interests appropriate for the pastoral ministry, personality, and overall effectiveness, using a five-point rating scale. Four faculty members, who

³⁵S. C. Webb, R. A. Goodling, I. L. Shepherd, "The Prediction of Field Work Ratings in a Theological School," Religious Education, 1958, 53, pp. 534-538.

were presumed to be most familiar with the largest number of students, did all the rating. Reliability, computed by the procedure of Horst, was intelligence .65; interest .50; personality .66; and total effectiveness .60, significant at the .01 level. Since intercorrelations were high, second-order partial correlations indicated that the total effectiveness ratings were highly and significantly associated with their estimate of the student's personality, significantly but less strongly with interest, and not significantly with their estimates of the student's intelligence. Several predictors, i.e. academic, interest, and personality measures, correlated significantly with faculty ratings, but the results are considered tentative.³⁶

The Spiers study, just completed, made use of the statistically more sophisticated procedures made possible by computers to test the predictive validity of the Entrance Test Battery, and each test separately, using as criterion measures grade point average, faculty ratings, peer ratings, and field work ratings on the MERS. In each case, each student

³⁶R. A. Goodling and S. C. Webb, "An Analysis of Faculty Ratings of Theological Students," Religious Education, 1959, 54, pp. 228-233.

was rated by three persons, the entire faculty taking part, and the Senior Practicum cooperating in the peer ratings. Interjudge reliability, computed by Kendall's Coefficient of Concordance W, was significant at the .05 level for the faculty ratings, and at the .01 level for the peer ratings. It was impossible to check the field work ratings, since each judge (church officer) rated only one person, but halo effect was observable, making "the inclusion of the church ratings questionable."³⁷ Multiple regression and correlation analyses were done, and multiple regression equations calculated. These equations were applied to the appropriate scores of a second sample for crossvalidation. The California Test of Mental Maturity was found to be a good predictor of grade point average and of faculty ratings. The Guilford-Zimmerman Objectivity and Thoughtfulness together, and the Kuder Mechanical, negatively weighted, were able to predict peer ratings for the experimental group, but the results did not hold for the cross-validation group. "It was discovered that the ratings (for the crossvalidation group) lacked agreement in the case of peer

³⁷ Duane E. Spiers, "A Study of the Predictive Validity of a Test Battery Administered to Theological Students," (Unpublished Doctor's Thesis, Purdue University, 1965) p. 63.

ratings."³⁸ The Theological School Inventory Intellectual Concern, negatively weighted, was able to predict field work ratings for both groups. In light of the halo effect, "this result must be accepted cautiously because no other variables were able to predict field work ratings for the crossvalidation group."³⁹ Guilford-Zimmerman Masculinity, negatively weighted, was able to predict church ratings for the experimental group, but not for the crossvalidation one. Similar results were found for the Guilford-Zimmerman Emotional Stability and Thoughtfulness variables for GPA, but the combination of Emotional Stability and California Test of Mental Maturity IQ together were able to predict for both groups. It should be noted that what was attempted here was precise prediction of grade point average and ratings to two decimal places.

In this chapter we have seen that psychological testing has been used increasingly in theological seminaries, especially since World War II. In 1954 was the beginning of real communication and cooperation, culminating in the establishment of the Ministry Studies Board in 1960. This venture has been successful enough that a full-time director is being called this year,

³⁸Ibid., p. 114.

³⁹Ibid., p. xii.

1965. In 1962, of 115 theological schools polled, 112 responded, of which ninety-two were using psychological tests, seventy-two different ones. DeWire could say, "It is apparent that psychological testing has become standard procedure in seminary training."

Testing is, except in a few cases, used for guidance rather than "screening out." It has come to be more generally accepted, but there are still notes of caution being sounded against using test results for screening, and against the misuse of testing, as indeed there are in personnel and guidance circles in general. In the case of the seminary student, there is always also the matter of the "call," which enters in, in addition to the questions of ability and mental health.

Research on seminary students--and clergymen--has been perhaps in proportion to that on other groups. It has been criticised for too largely using short-cut and single dimensional criteria, and pick-up predictors. It has been handicapped by the lack of generally recognized criteria for ministerial effectiveness. The multiple roles of the minister make these criteria even harder to establish. The research has usually been of two kinds, normative studies and predictive validity studies. The first have shown that ministers

differ significantly from men in general, while the second have had mixed and not too encouraging results, partly because of the real problem of criterion measures. Some studies of both kinds using the MMPI have been reviewed.

CHAPTER III

DESIGN OF THE STUDY

As stated in the first chapter, the purpose of this study was (1) to establish norms for the Minnesota Multi-phasic Personality Inventory for Christian Theological Seminary that could be compared with general norms and with norms of two other studies to help answer the question of how clergymen differ from non-clergymen and whether special norms need to be taken into consideration in the interpretation of MMPI protocols with Seminary students; and (2) to see whether there are variables measured by the MMPI which can differentiate between effective and ineffective ministers and/or predict ministerial effectiveness as measured by (a) academic success as shown by grade point average for two semesters of Seminary work, (b) ratings by the faculty and (c) ratings by fellow students, both using the Ministerial Effectiveness Rating Scale.

The first required the calculation of means and standard deviations for the groups involved, and the second, the calculation of intercorrelations and the analysis of variance for regression of each set of scales with each criterion measure, to be used in a Wherry-Doolittle test selection procedure to establish the proper regression equation for each.

This regression equation then was used to predict the criterion measure for a crossvalidation group, and the coefficient of correlation between the predicted and achieved scores found and tested for significance. The description of the instruments involved, the subjects used, the process of gathering the data, and the statistical procedures used, form the subject matter of this chapter.

I. INSTRUMENTS USED

The Minnesota Multiphasic Personality Inventory. The Group Form of the MMPI was administered, using the National Computer Systems answer sheets, and sent to the National Computer Systems for scoring. The answer sheets were scored for the usual validity scales, ψ , L, F, and K, the usual clinical scales, Hs, D., Hy, Pd, Mf, Pa, Pt, Sc, and Si. The descriptions of these scales are found in the Manual, and in much more complete detail, in An MMPI Handbook. In addition, NCS scored the answer sheets for the eleven other Research scales they score routinely: A - First Factor, R- Second Factor, Es - Ego Strength, Lb - Low Back Pain (Functional), Ca - Caudality, Dy - Dependency, Do - Dominance, Re - Social Responsibility, Pr - Prejudice, St - Social Status, and Cn - Control.

By special request, the sheets were also scored according to the "Clifford E. Davis Output", their designation for the set of thirty-four Auxiliary scales chosen by Dr. Davis as having possible usefulness with seminary students, and included in his normative studies of Presbyterian Seminarians. These thirty-four are listed below, the scale number being the number of the scale as listed in An MMPI Handbook, pp. 443-468.

2	Ac	Academic Achievement
4	Ae	College Achievement
16	At	Iowa Manifest Anxiety
	Hsx	Homosexuality
47	De	Delinquency
50	Do-r	Dominance
57	Dy	Dependency
58	Ec	Escapism
59	Em	Emotional Immaturity
60	Eo	Ego Overcontrol
62	Es	Ego Strength
71	Gr	Graduate School Potential
74	Hc	Hostility Control
78	Hr	Honor Point Ratio
92	Ie	Intellectual Efficiency
93	Im	Impulsivity
106	Lp	Leadership
124	Mp	Malingering
131	No	Neurotic Overcontrol
134	Nu	Neurotic Undercontrol
135	Or	Originality
162	Pr	Prejudice
167	Pv	Pharisaic Virtue
174	Re-r	Social Responsibility, revised
176	Rg-m	Rigidity, Male
177	Rp	Role Playing
189	Sf	Self-sufficiency
195	So-r	Social Desirability, revised
196	Sp	Social Participation

200	St-r	Social Status, revised
201	Sv	Sexual Deviation
205	To	Tolerance
206	Tp	Teaching Potentiality
210	Un	Underachievement

A short description of these scales is found in Appendix A.

The scores for these scales were listed close to the right hand edge of the NCS MMPI profile report form.

The Ministerial Effectiveness Rating Scale. This scale is used routinely by the Department of Field Education of Christian Theological Seminary for securing ratings of the effectiveness of the students in their student church assignments. It was devised by Dr. Lowell G. Colston of the Department of Pastoral Care and a committee of the faculty, and approved by the entire faculty for use. Each of sixteen items and a seventeenth global item is rated on a ten point scale, with 0 being low and nine being high. The items are:

1. Quality of Religious Life.
The vitality of his personal Christian Commitment.
2. Christian Influence.
His influence in inspiring faith in others.
3. Personal Habits.
Courtesy, neatness and manners.
4. General Culture
Esthetic sensitivity: appreciation for cultural pursuits.

5. Personal Integrity.
The degree of his dependability, honesty, sincerity, reliability.
6. Financial Responsibility.
Evidence of concern for financial obligations and responsible effort to meet them promptly.
7. Social Participation.
How active was/is he in his participation in the life of the community where you have known him?
8. Intellectual Growth.
Evidence of intellectual growth and critical thought.
9. Theological Alertness.
Interest in theological discussion and awareness of theological issues and trends.
10. Common Sense.
Ability to "size-up" situations quickly and accurately; to use "good judgment"; and to exercise self-control.
11. Empathy.
Insight into the way the other person views things; capacity to "feel with" him; and to understand his meanings.
12. Emotional Stability.
Ability to meet problems under pressure.
13. Social Conscience.
Moral sensitivity to social issues in contemporary society.
14. Ability to Communicate.
Evidence that through written or spoken word he is able to organize and communicate his ideas clearly, coherently, and concisely.
15. Administrative skill.
Ability in organizing and leading groups of individuals.

16. Attitude Toward Other Churches.
The degree of his cooperation with other churches and his responsible action in interfaith activity.
17. General Impression.
How would you rate this person as to his potential effectiveness in the ministry?

Instructions included that where the rater felt he had no basis for judgment on a particular item, he was to place a large "X" through the entire statement. A copy of the Ministerial Effectiveness Scale is included in Appendix A.

Grade Point Average. Grades at Christian Theological Seminary are on a four point system: A = Superior = four grade points, B = Good = three grade points, C = Fair = two grade points, D = Poor = one grade point, F = Failure = zero points. Further markings are: I = Incomplete, W = Official Withdrawal by stated date, UWF = Unofficial Withdrawal Failure, or any withdrawal after final date and unofficial withdrawal at any time. The student must earn a grade point average of 2.0 to receive the Bachelor of Divinity degree (B.D.), the Master of Religious Education degree (M.R.E.), or the Master of Sacred Music (M.S.M.). A 3.5 average is required for the Master of Theology degree (Th.M.). Any undergraduate student whose grade point average falls below 2.0 is placed on probation

and allowed to take only the minimum enrollment of nine hours until the required grade point average is again achieved.

II. SUBJECTS FOR THE STUDY

The Experimental Group. The students who had been included in the Spiers study in the Spring, 1963, and on whom therefore there were criteria data available, were asked to take the MMPI on a voluntary basis in September, 1963. Of fifty-one enrolled, forty-seven actually took the test, and made up the experimental group.

The Crossvalidation Group. The MMPI was administered to the entering class in September, 1963, as part of the entrance battery. After women and foreign students were eliminated, there remained thirty-two subjects for the crossvalidation group.

The Cross Section Group. In addition to the two groups above, other students took the MMPI on a voluntary basis, sixteen graduate students and eleven upperclassmen who had not been included in the Spiers study for lack of some part of the data needed. The MMPI scores of this group were added to those of the experimental and crossvalidation groups to calculate

norms that might be called "cross section" norms, including as large a part of the student body as possible. There were 106 in this group.

The Norm Group. Since the United Presbyterian and the Southern California School of Theology norms were based on the MMPI given at entrance, for valid comparison, CTS norms had to be calculated using the scores of entering classes. So the forty-four male, non-foreign, students of the entering class of September, 1964, were used with the thirty-two students of the entering class of 1963 (crossvalidation group) as the subjects for the norm group, with an N of seventy-six.

III. COLLECTING THE DATA

Independent Variables. The independent, or predictor variables, were the clinical scales of the MMPI taken with and without K correction, the validity scales L, F, and K, the eleven research scales, and thirty-four auxiliary scales included in the "Clifford E. Davis output" described previously. In order to collect these data, all returning students were asked at the time of registration to take the MMPI on a voluntary basis. The MMPI was administered to the entering class as part of their entrance battery. All this was done in

September and early October, 1963, and the answer sheets scored by the National Computer Systems, as described previously.

The raw scores were entered on data sheets, and punched on IBM cards, one card for the Clinical and Research scales, and another for the Auxiliary scales. A duplicate deck was punched in each case and the two decks printed out for verification by comparison.

The Language Factor, Non-language, and Total Mental Factors scores on the California Test of Mental Maturity, Short Form, 1957, were also punched on the card with the clinical and research scale scores for another purpose, but were found useful later in this study.

Dependent Variables. The dependent, or criterion variables were grade point average, faculty ratings, and peer ratings. The grade point averages for the students at the end of two semesters of seminary work were furnished by the registrar's office, and recorded on the data sheet for criterion measures.

To secure faculty ratings on the students involved in the experimental group, a list of the students was first given to each faculty member, with instructions to check how well he

knew each student according to the following key: 0 = not acquainted; 1 = casual acquaintance; 2 = average acquaintance; 3 = well acquainted. The students were assigned on a random basis to faculty members who had checked either a 2 or a 3 by their name, indicating sufficient acquaintance for rating.

Three ratings were secured for each student, by sending the Ministerial Effectiveness Rating Scale forms to the faculty members in a sealed envelope, to be returned the same way. The student's names and the name of the faculty member were coded.

The spread on the rating of the items was narrowed by the raters themselves from ten to about five points, making it less discriminating. And previous research has shown that "halo effect" in ratings of this kind further reduce the discrimination shown, in that raters who rate a person high in one thing tend to rate him high in all, or vice versa, so only a global score seemed valid to use.¹ Therefore, the ratings on the seventeen items were averaged together to give a global rating. Since instructions were, "Where you have no basis for judgment, please place a large "X" through the entire statement," all seventeen items were not always rated. In this case the

¹James Dittes, "Research on Clergymen," Religious Education, 1962, 57, Research Supplement, p. S-157.

scores of those which has been checked were averaged. Each average, or global, rating was entered on the data sheet for criterion measures, three for each student. Then the three ratings were averaged together to give the mean rating used as the criterion measure called Facrat (Faculty Rating).

The same general procedure was used in securing the peer ratings using the MERS. These ratings were done by the students in the Senior Practicum, with the cooperation of Professor Vinton Bradshaw, Director of Field Education. The students were first asked to indicate how well they knew those to be rated, using the same form mentioned above. Then assignments for rating were made on the basis of the names marked with a "2" or a "3," as indicating sufficient acquaintance for rating. Again, the names of both raters and rated were coded. The rating was done during class time. As with the faculty ratings, the scores on the items were averaged for a global score, and the three scores entered on data sheets and averaged together to give the mean rating, which became the student's score on Peerat (Peer Rating).

These three dependent variables, GPA, Facrat, and Peerat, were punched into the IBM criterion card for each student, together with his identifying information.

The same procedure was followed in collecting data for the crossvalidation study. The grade point averages were supplied by the registrar's office. The peer ratings were done by students in the Senior Practicum, with the cooperation of Dr. James Blair Miller, who replaced Professor Bradshaw during his leave of absence. This was done in the Spring of 1965, in order to give the students as long as possible to get well acquainted. Since the crossvalidation group had entered in September, 1963, this represented a year and a half for most. These scores were entered on appropriate data sheets, but not punched on IBM cards, since other statistical procedures were used in the crossvalidation process.

IV. STATISTICAL PROCEDURES

Experimental Group. The statistical analysis of the data was done on the 7090 Computer at Purdue University, using the BMD 29 Program to compute the Multiple Regression and Correlation Analyses. This program was developed by the Health Sciences Computing Facility, Department of Preventive Medicine and Public Health, School of Medicine, University of California, Los Angeles. A description of this program is found in the BMD Biomedical Computer Programs Manual, W. J. Dixon,

Editor, 1964 Edition. The BIND 29 program has been slightly changed, a step of printing out the F-test for each variable added in building up the Multiple R having been added, and in this manual is known as the BMD 3R.

This program is designed to simulate a Wherry-Doolittle test selection procedure. The independent variables are listed in the order of their importance based on the reduction of sum of squares of the dependent variable attributable successively to each independent variable. Output for this program includes:

- (1) Sums and sums of squares
- (2) Cross-products of deviations
- (3) Simple correlation coefficients
- (4) Means and standard deviations
- (5) Regression coefficients, their standard errors and t-values
- (6) Sums of squares and mean squares due to regression and deviation about regression, with degrees of freedom and F-value
- (7) Sums of squares due to regression for each variable
- (8) Standard error of estimate
- (9) Partial correlation coefficients
- (10) Multiple correlation coefficient, R

(11) Table of residuals.²

Since three dependent or criterion variables were used, separate analyses were made for each. The program was run once using the clinical and research scales separately then together with each of these measures. Then another run was made using the thirty-four experimental scales with each of the dependent variables. For each regression equation the computer calculated the predicted score for each subject, then compared it with the obtained score, in the Table of Residuals.

Though the computer used all the variables in its analysis of variance for regression, and again used all of them in the regression equation, the F-value often did not reach the .05 level of significance. But in most cases some of the variables taken together had a significant F-value, so a simpler regression equation was calculated, using the Wherry-Doolittle Test Selection Procedure. Only those variables that met the following restrictions were used:

- a. Each variable must account for a significant proportion of the variance as tested by the F-value for each

²W. J. Dixon, Ed., BMD Biomedical Computer Programs Manual (Los Angeles, University of California, Los Angeles, 1964), p. 258.

term at the .05 level.

b. Each variable must serve to reduce the standard error of estimate.

c. Each variable must yield a significant Multiple R when used with the other variables in the regression equation.

The new, simplified regression equation was found first using beta weights, then transformed into an equation in score form, ready to use for prediction of the criterion measures from the raw scores of the appropriate independent variables. As a part of the process, the percentage of the variance of the criterion measure accounted for by the battery, and for each scale in the battery, was calculated. Then the shrunken multiple correlation coefficient, corrected for chance errors, was found, and the standard error of estimate calculated, following the procedure as given by Garrett in his Statistics in Psychology and Education.³

Norms and Intercorrelations. A third run of the BIMD 29 program was made, using the MMPI raw score data for all the students who took it, against Grade Point Average as the only

³Henry E. Garrett, Statistics in Psychology and Education (New York, Longmans, Green and Co., 1958), pp.426-40.

criterion measure available on all of them. The total of 106 subjects included the forty-seven upper-classmen who formed the experimental group, the thirty-two entering students who were the subjects of the crossvalidation group, and the twenty-seven others, both undergraduates and several working toward graduate degrees. This represented as large a part of the student body as possible, 106 out of 145 after women, foreign students, and students registered for "thesis only" were eliminated. Means and standard deviations for this group are given under the heading "cross section."

However, the norms for the Presbyterian seminary students were based on the MMPI administered at entrance, as were the norms for the Southern California School of Theology. Therefore, to be strictly comparable, norms for CTS had to be calculated on the scores of entering students only. So the scores of the entering class of 1964 were pooled with the scores of the entering class of 1963, who made up the cross-validation group, and used for the calculation of "norms." This was done by calculator, using the formula for calculating standard deviation from original scores by the short method:⁴

⁴Ibid., p. 53.

$$SD = \frac{N\sum X^2 - (\sum X)^2}{N}$$

It is difficult for statistical comparison when some norms are given in raw scores and some in T scores. The Presbyterian norms are in raw scores, while those of the Southern California School of Theology are given in T scores. General population norms on the profile form usually used give both, so a comparison is most easily made by plotting profiles on this report form. Comparison with the Presbyterian norms was made in raw scores, while all four were compared by plotting the appropriate profiles on the same form.

Comparative profiles of the experimental and crossvalidation groups were based on the means and standard deviations of these groups as found in the appropriate analyses. The significance of the difference between the means of these two groups was calculated to see whether the two groups were comparable, using the formula for calculating the standard error of the difference between uncorrelated means:⁵

$$\sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}$$

⁵Ibid., p. 214.

Then the critical ratio was computed by dividing the difference between the sample means by its standard error ($CR = D/\sigma_0$).⁶ From Table A, the .05 level of significance is 1.96, and the .01 level of significance is 2.58.⁷ The .05 level was accepted for this study.

The intercorrelations of the criterion measures themselves were found in the statistical procedures for the experimental group, as part of the analysis of variance for regression.

Crossvalidation. Each multiple regression equation found in the procedures described above was used with the raw scores on the appropriate scales to predict the criterion measure for each student included in the crossvalidation group. The correlation between the predicted and the achieved scores was found in each case, using the formula for calculating r from raw scores when deviations are taken from zero:⁸

$$r = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2] [N\sum Y^2 - (\sum Y)^2]}}$$

These correlations were tested for significance, and the standard error of estimate calculated.

⁶Ibid., p. 215.

⁷Ibid., p. 446

⁸Ibid., p. 143.

Inter-judge Reliability. When it seemed appropriate to test the inter-judge reliability of the ratings, Kendall's Coefficient of Concordance W as described in Siegel's Non-parametric Statistics for the Behavioral Sciences was used. The peer ratings for both the experimental and the crossvalidation groups and the faculty ratings for the experimental groups were tested. "A high or significant value of W may be interpreted as meaning that the observers or judges are applying essentially the same standard in ranking the N objects under study."⁹ W expresses the degree of association among several sets of rankings, and is computed by the formula:

$$W = \frac{s}{\frac{1}{12} k^2 (N^3 - N)}$$

where s = sum of squares of the observed deviations from the mean of

$$R_j, \text{ that is, } s = \sum (R_j - \frac{R_j}{N})^2$$

k = number of sets of rankings, e.g., the number of judges

N = number of entities (objects or individuals) ranked

$\frac{1}{12} k^2 (N^3 - N)$ = maximum possible sum of the squared

⁹Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York, McGraw Hill Book Co., Inc., 1956), p. 237.

deviations, i.e., the sum s which would occur with perfect agreement among k rankings.¹⁰

The value of W was tested for significance by computing Chi-square by the formula: $X^2 = k(N-1)W$, with $N-1$ degrees of freedom.

The level of significance set for the study was .05, and in any tables, this level is indicated by an asterisk(*). The .01 level is indicated by two asterisks(**).

The results of the procedures described in this chapter will be given in the next two chapters. Chapter IV will include the means and standard deviations for various groups in the study, and the norms for Christian Theological Seminary. These norms will be compared with those for United Presbyterian and Southern California School of Theology seminarians. In Chapter V the results of the analyses of variance for regression will be presented, and the multiple regression equations found for prediction of each of the criterion measures. Whether these equations were able to predict significantly the scores of the crossvalidation group will be seen.

¹⁰Ibid., p. 231

CHAPTER IV

RESULTS: NORMS

One of the purposes of this study was to establish norms for students at Christian Theological Seminary that could be compared with general norms and with the norms of two other studies of Protestant seminarians. It was felt that this would help answer the questions of (a) how clergymen differ from non-clergymen and (b) whether special and/or local CTS norms are needed. The findings of this part of the study will be presented in this chapter, first those having to do with the clinical and research scales, and then those with regard to the experimental scales.

I. CLINICAL AND RESEARCH SCALES

As a part of the statistical procedures of the study, means and standard deviations for several groups and groupings within the student body of CTS were calculated, including the experimental group, the crossvalidation group (entering class of 1963), graduate students, the entering class of 1964, the cross section grouping of the first three, and the "norm"

group, composed of the entering classes of 1963 and 1964. These intra-seminary groups will be compared first, then the norms established for CTS on the clinical scales will be compared with the norms of the United Presbyterian seminarians and with those of the Southern California School of Theology, as well as with general population norms.

CTS Norms and intergroup comparisons. In September and October of 1963, 106 men students at CTS took the MMPI. This was out of 145 after women, foreign students, and students working on "thesis only" were eliminated. Of this 106, thirty-two were entering students who took the MMPI as part of their battery of tests. This group became the crossvalidation group. Forty-seven who had been included in the Spiers study in the spring took it on a voluntary basis, and were used as the experimental group. Twenty-seven others also took it voluntarily, of whom sixteen were graduate students and twelve were upperclassmen on whom some data had been lacking and who therefore could not be included in the Spiers study. The data of the entire group of 106 were used for the calculation of means and standard deviations of the "cross section" group, representing a typical student body at one time. These could be considered "norms" and would correspond to Bier's norms

for Catholic seminarians, who were also in various years of their study when tested.¹

However, the norms for the United Presbyterian seminary students and those for the students at Southern California School of Theology were based on the MMPI administered at entrance. So, to be comparable, norms for CTS had to be established on entering students. During the study another class had entered, that of September, 1964, who had also taken the MMPI as part of their entrance battery of tests. The data for the two entering classes were pooled and used for the calculation of "norms" for the seminary, with an N of seventy-six. Since the MMPI is now part of the entrance battery, and interpretation of profiles will be made during the first year of seminary work, as a rule, these may be preferable to use for norms.

A comparison of the means of the various groups within CTS is very interesting. In Table III are listed the means of the clinical scales for the Experimental, Crossvalidation, Graduate, Cross section, Entering class, 1964, and Norm groups.

¹W. C. Bier, "A Comparative Study of Five Catholic College Groups on the MMPI", Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, Univ. of Minnesota Press, 1956), pp. 587-88.

TABLE III

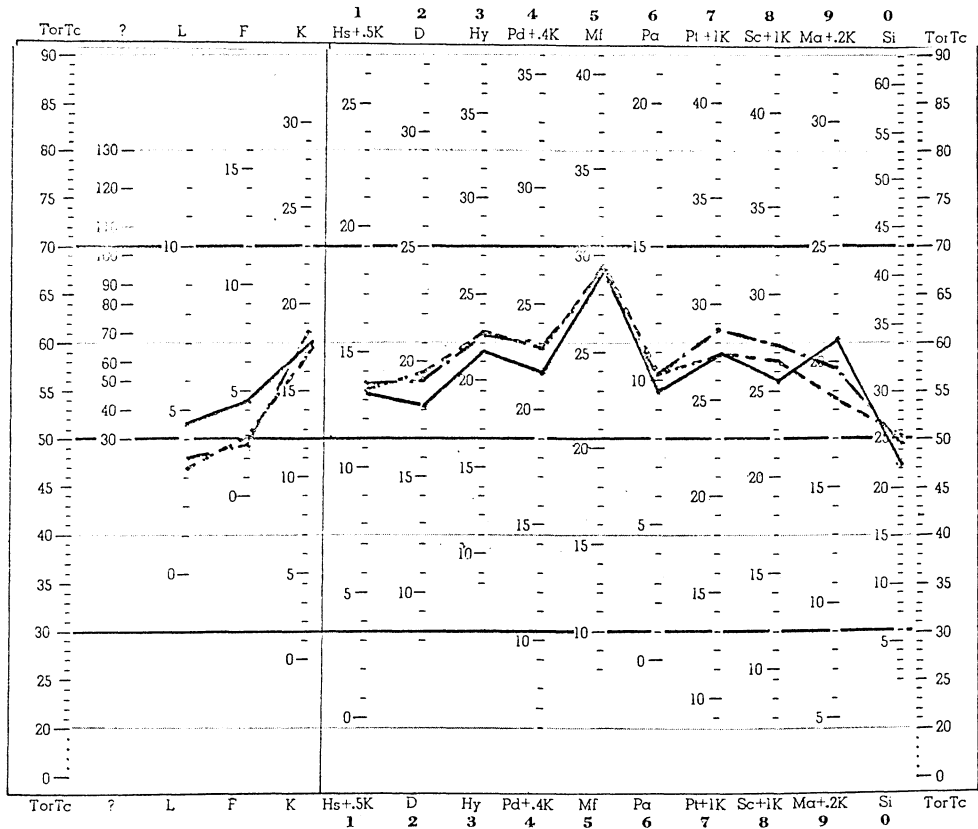
MINNESOTA MULTIPHASIC PERSONALITY INVENTORY
 COMPARISON OF THE MEANS OF THE EXPERIMENTAL, CROSSVALIDATION,
 GRADUATE, 1964, AND TOTAL GROUPS

	Experi- mental	Crossval- idation	Graduate	Entering 1964	Norms	Cross section
L	3.26	4.47	3.56	4.50	4.49	3.65
F	3.00	4.28	2.75	2.80	3.42	3.41
K	17.17	17.34	18.06	17.36	17.36	17.35
Hs+.5K	13.26	13.13	13.69	12.36	12.68	13.18
D	19.32	18.09	19.06	17.45	17.72	18.81
Hy	22.51	21.41	22.56	20.64	20.96	22.08
Pd+.4K	22.74	21.94	22.81	21.84	21.88	22.55
Mf	29.28	29.13	29.06	27.11	27.96	29.11
Pa	10.17	9.63	10.13	9.89	9.78	9.92
Pt+1K	27.28	27.28	28.75	26.45	26.80	27.42
Sc+1K	26.45	25.50	27.31	24.91	25.16	26.11
Ma+.2K	18.60	21.06	19.81	18.84	19.78	19.61
Si	25.21	22.50	24.56	23.25	22.93	23.97
	N = 47	N = 32	N = 16	N = 44	N = 76	N = 106
Age	27.66	27.63	33.94	28.30	28.02	

The similarities and differences are more easily seen when the profiles are plotted on the usual profile form, which also gives a comparison with the general population norms at the same time. The comparison of the profiles of three groups within the seminary at the same time, the entering class of 1963 (crossvalidation group), the upperclassmen (experimental group), and the graduate students, is shown in Figure 1. The profiles show a general tendency to be higher as the groups progress through seminary, the upperclassmen and the graduate students having higher mean scores on Hs, D, Hy, Pa, Sc, and Si, with the graduates higher than the other two on Pt and K. Mf scores for all three are very close together, within .22 of a raw score point. The older students were lower on L and F, however. One might make a very general interpretation that the advanced students are more frank and rational, less optimistic, more conventional, with a somewhat lower level of energy and ambition, and less extroverted and outgoing socially.

This raises the question of what factors might be operating. Because of the early noted tendency for higher scores at higher ages,² Bier corrected for age differences by

²S. R. Hathaway and J. C. McKinley, "Scale 2 (Depression)", Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, Univ. of Minnesota Press, 1956), p. 80.



Entering class———— Upperclassmen----- Graduate -.-

Figure 1. Comparative MMPI profiles of the entering class of 1963 (crossvalidation group), upperclassmen (experimental group), and graduate students.

a covariance technique, and found a "tendency for the scores of the older groups to be lowered and those for the youngest group to be raised."³ This was true for the first seven clinical scales, but the opposite was true for the last two, Sc and Ma (Si was not included in the study). "The general average correction for age difference is 0.593 (T scores). The D scale shows an average age correction of more than twice that amount, namely, 1.187; while the Pd scale shows hardly any influence at all, 0.010. On the basis of these results, therefore, D appears more than one hundred times more subject to the influence of age differences than the Pd scale. These scales represent the extremes in this respect, the others ranging in between."⁴ When the average ages of the three CTS groups are compared, these for the experimental and crossvalidation groups are almost the same, 27.66 and 27.63 respectively. However, the average age of the graduate students is 33.94. While age undoubtedly enters in, other factors must also be involved.

Chance is certainly another factor. When tested for the significance of the difference between the means, only two differences between the experimental and crossvalidation groups were significant: L at the .02 level and Ma+K at the .01

³Bier, op. cit., p. 590.

⁴Ibid., p. 590.

level, with the older group lower on both these two scales. The other differences could be due to chance.

But that something other than chance may be involved may be deduced from a comparison with the findings of Fielder in a test-retest study of seminarians at Southern California School of Theology. One class, the graduating class of 1963, were asked to retake the MMPI at the end of their senior year when they had finished their academic work, and all of them complied. This gave a comparison of the mean profiles of the same students when they entered seminary, and when they completed their work three years later. His findings, expressed in T scores, are reproduced in Table IV while the two profiles are compared in Figure 2.⁵ Although only one difference shown in Table IV was significant at the .05 level, the fact that the differences were so similar in direction and degree to those found at CTS would seem to indicate that some similar factor or factors were operating. In both studies, L was lower, Ma was lower, and Hs, D, Hy, Pd, Pa, Sc, and Si were higher. In Figure 2 comparative profiles for both

⁵Daniel W. Fielder, "A Nomothetic Study of the Southern California School of Theology Seminarian." (Unpublished Doctor's thesis, Southern California School of Theology, 1964), pp. 206-211.

TABLE IV

THE MEAN SCORES, STANDARD DEVIATIONS, AND
THE DIFFERENCE BETWEEN MEANS ON A TEST-
RETEST OF SCST STUDENTS (N-21)**

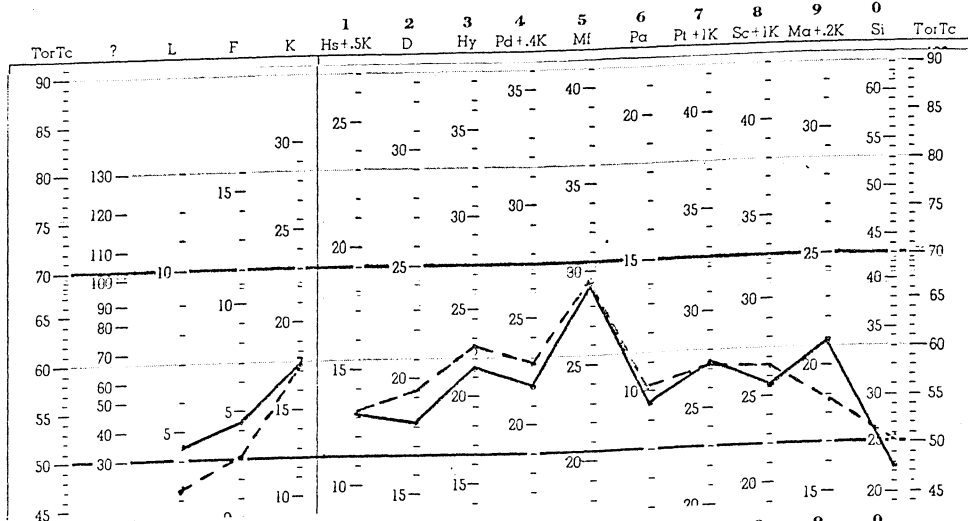
Scale	<u>Junior Year</u>		<u>Senior Year</u>		Difference Between Means
	Mean	Standard Deviation	Mean	Standard Deviation	
L	50.95	7.93	47.62	4.47	1.20
F	48.57	4.24	49.67	3.87	.78
K	62.48	6.78	64.90	4.69	1.58
1 Hs	51.71	5.47	55.86	8.37	2.59*
2 D	52.38	8.25	52.48	10.32	.49
3 Hy	60.43	4.69	62.71	6.00	1.48
4 Pd	58.14	5.91	60.19	8.14	1.16
5 Mf	67.67	7.21	65.86	8.66	.95
6 Pa	54.81	5.47	56.95	6.85	1.28
7 Pt	58.71	7.93	59.34	9.49	.32
8 Sc	57.71	9.16	60.19	9.79	1.64
9 Ma	60.53	8.36	58.00	8.88	1.30
0 Si	43.86	6.93	44.81	6.33	.55

*Significant at the .05 level

**From Daniel W. Fielder, "A Nomothetic Study of the Southern California School of Theology Seminarian", (Unpublished Doctor's Thesis, Southern California School of Theology, 1964). p. 208.

CTS
 Entering

 Upperclass-
 men-----



SCST
 Entrance

 Graduation

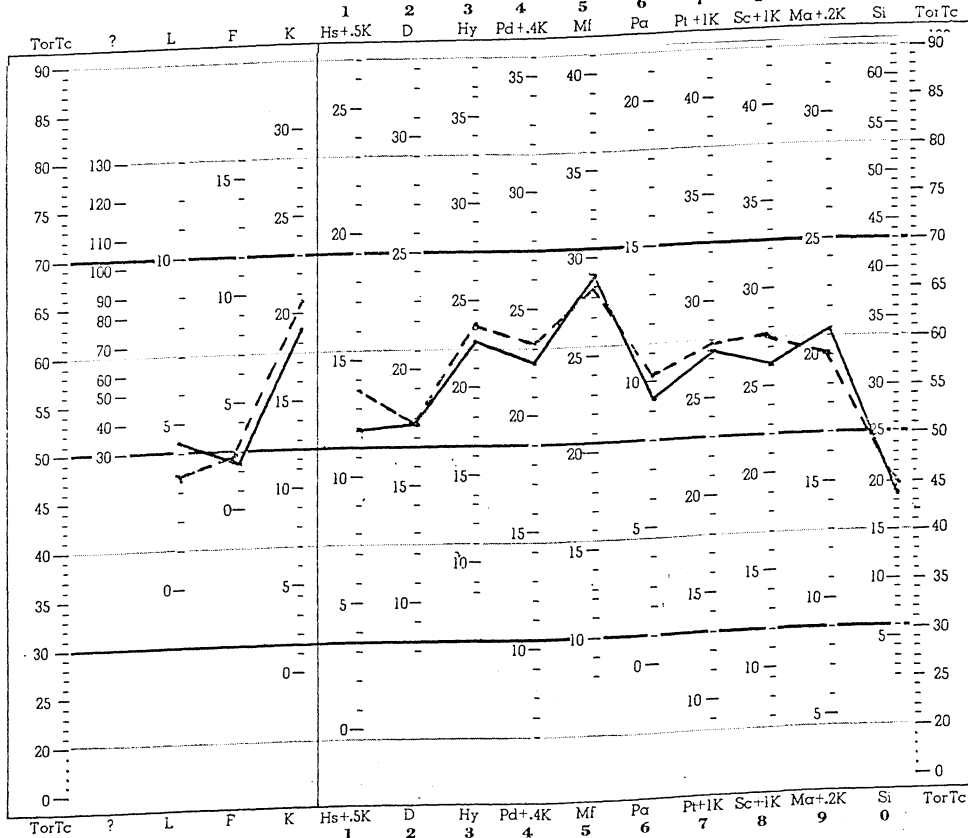


Figure 2. Mean profiles of the entering class and upperclassmen at CTS in the fall of 1963 compared with the test-retest profile of a class at SCST at entrance and on graduation.

studies are placed side by side for easy comparison, and the similarities are striking.

Fielder also studied the records of nine students who dropped out, either while in the seminary or shortly afterwards, and changed to other occupations. While the sample is small, it may be suggestive. He found "the scores of drop-outs tend in the direction of the general population on all scales except the L and Sc scales. The differences may be interpreted to indicate that the persisting minister is characterized and sustained in his ministry by a certain elevation, characteristic of the ministry, from the general population as shown on the MMPI scales and the drop-out leaves the ministry because he is more like the general population."⁶

This is an interesting theory, and one which would need verification by repeated studies. If true, the net effect of the self-elimination of the drop-out with his profile closer to the population mean would be to leave the students with higher profiles, and raise the mean profile of the upperclassmen. But it still would not explain the fact that test-retest showed higher profiles for the same students on graduation

⁶Ibid., pp. 233-235.

than on entrance. More study is needed to discover whether this trend is consistently found, and what the nature of the factor or factors operating might be, whether it be something in the seminary experience or in the experience in the ministry, or self-selection. Item analyses might be most helpful here.

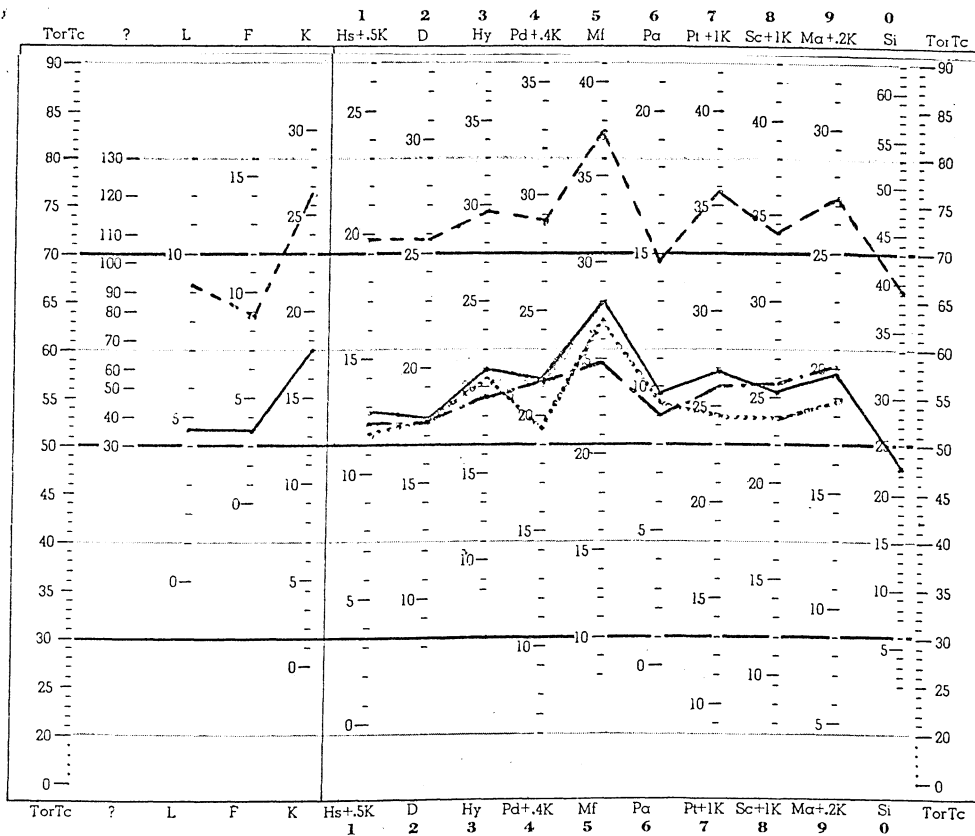
Comparison with other norms. In Figure 3 the CTS norm profiles at the mean and at two standard deviations above the mean are plotted on the usual report form giving general population norms. The CTS means on all scales except Si are above the mean of the general population. The scores on Hy, Pd, Pa, Pt, Sc, and Ma are more than half a standard deviation above the mean, meaning that they exceed the scores of 69 per cent of the general population. Mf, the peak score, reaches a T score of sixty-five, one and a half standard deviations above the mean, exceeding the scores of 87 per cent. Probably 20 per cent of the CTS students could be expected to have a T score on Mf above seventy, which compares with an expected 2 per cent of the general population. A consideration of the profile at two standard deviations above the mean of their own group would indicate that a much larger than average percentage of seminary students can be expected to have T scores

above seventy on some scales.

It was similar findings that led other researchers to feel that special norms were necessary for certain groups. Goodstein found that, "if 70 is used as the cutting score,... we would have identified approximately half of our 5000 male college students as abnormal...While this, of course, may be a valid 'diagnosis,' the capacity of our college mental hygiene facilities certainly demands a more rigorous screening instrument. Seemingly the usefulness of the MMPI as a screening test in the collegiate setting would depend upon the development of new cutting scores."⁷ The mean profile of the college students in his study is plotted on Figure 3, for comparison with the CTS profile, and the CTS profile is even more deviant.

Bier found that the seminary group differed significantly from the other groups involved at the .01 level on six of the nine scales, and continued, "the entire experimental population shows in accentuated form the general

⁷L. D. Goodstein, "Regional Differences in MMPI Responses among Male College Students," Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, University of Minnesota Press, 1956), p. 577.



CTS Mean _____ Catholic
 CTS 2 SD above mean ----- College -.....

Figure 3. Profiles of the CTS norm group on the clinical scales of the MMPI at the mean and at two standard deviations above the mean, compared with the mean profiles of Catholic seminarians and college males.

tendency of college and college-educated groups to score higher on the MMPI scales than the general population on which the test norms have been based. If the seminary group is differentiated to the extent indicated above from other groups in an already deviant population, it is an a fortiori argument that the differentiation from the general population is even greater and hence that the modification of these general norms is even more necessary."⁸ The profile of Bier's Catholic seminarians is also plotted in Figure 3, and on most scales the CTS scores are even higher.

It would seem to follow, then that the CTS norms are sufficiently different from general population norms to make it necessary to take them into consideration in the interpretation of individual profiles. This might be most conveniently done by using plastic overlays with the special norms on them, as recommended by Davis.⁹

The comparison of CTS norms with those of the Southern California School of Theology and United Presbyterian

⁸Bier, op. cit., p. 597.

⁹Clifford E. Davis, Guide for Counseling Prospective Church Workers, Supplement II, (Pittsburgh, Board of Christian Education, United Presbyterian Church, 1963), p. 21.

seminarians shows that Protestant seminarians may have a characteristic profile that is more similar to each other than to Catholic seminarians or college population. The means and standard deviations of the general population, United Presbyterian, and CTS norm groups, in raw score form, are presented in Table V. The scores of the SCST students are given in T score form, so comparison with these is made by means of the profiles in Figure 4.

The differences between the means of the United Presbyterian and the CTS norms are very small: L, .15; F, .68*; K, 1.64**; Hs, .71; D, 1.93**; Hy, .62; Pd, .27; Mf, .19; Pa, .01; Pt, 1.19*; Sc, .25; Ma, .47; and Si, 3.62**. When these differences were tested for the significance of the difference between the means, the differences on F and Pt were found to be significant at the .05 level, and those on D, K, and Si at the .01 level. It should be noted that with a N of 300 for the Presbyterian group and of seventy-six for the CTS group, a difference of only .68 of a raw score point on F was significant at the .05 level, as was the difference of 1.19 on Pt. The differences on K and D, though statistically significant, were only 1.64 and 1.93 respectively, and the largest difference, on Si, was 3.62, less than half a standard

TABLE V

MINNESOTA MULTIPHASIC PERSONALITY INVENTORY
 CLINICAL SCALE NORMS FOR GENERAL POPULATION, CHRISTIAN
 THEOLOGICAL SEMINARY AND PRESBYTERIAN SEMINARY MALES

	General Population*		Christian Theological Seminary		Presbyterian Seminary**	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
L	4.05	2.89	4.49	2.34	4.34	2.56
F	3.88	4.24	3.42	2.68	2.74	1.86
K	13.45	5.66	17.36	4.66	19.00	4.19
HS+.5K	11.34	3.90	12.68	3.60	11.97	2.94
D	16.63	4.18	17.72	4.05	15.79	3.56
HY	16.49	5.51	20.96	4.37	21.58	3.82
PD+.4K	19.30	4.11	21.88	3.43	22.15	3.74
MF	20.44	5.13	27.96	4.67	27.77	4.53
PA	8.06	3.56	9.78	2.51	9.79	2.89
PT+1K	22.95	4.88	26.80	4.47	25.61	4.23
SC+1K	22.26	5.21	25.16	4.14	25.41	4.45
MA+.2K	17.00	3.87	19.78	3.67	19.31	4.13
Si	25.00	9.58	22.93	8.20	19.31	6.36

*From "Some Normative Data of New MMPI Scales" by Starke R. Hathaway and Peter F. Briggs, in Journal of Clinical Psychology, XIII, No. 4, pp. 364-368, October 1957.

**From Guide for Counseling Prospective Church Workers, Supplement II, by Clifford E. Davis. Pittsburgh, Board of Christian Education, United Presbyterian Church, 1963.

deviation of the CTS mean. While these are statistically significant, they seem to the author to be too small to be of practical significance, especially when the differences of .01 to .71 on the other eight scales are so very small. This would be in accord with Black's conclusion from his study of MMPI data on college females from fifteen different colleges and universities. Although he did not have an over-all test of significance, he concluded, "these data suggest that there is a characteristic profile for college women which does not differ from college to college. It is certainly true that some of the differences are statistically significant, but that they are of little practical significance."¹⁰ The same general conclusion was reached by Goodstein in his study of college males, "there were no significant regional differences...The obtained differences are apparently of such little consequence that the development of regional or local norms seems unnecessary."¹¹

Examination of the profiles in Figure 4 strengthens

¹⁰J. D. Black, "The Interpretation of MMPI Profiles of College Women," Dissertation Abstracts, 1953, 13, pp. 870-871.

¹¹Goodstein, op. cit., p. 578.

this impression. The scores are almost identical on Mf, Pa, L, and Sc. The greatest spread is on D, with the Presbyterian seminarians seeming more optimistic than the average person, the SCST seminarian exactly average, and the CTS student somewhat less optimistic than average. The SCST and Presbyterian profiles coincide on Si, lower than the CTS student. They seem to be more outgoing, socially extroverted than the CTS student, who, in turn, is more outgoing than the average person. The SCST seminarian seems to be the most defensive against psychological weakness, with the Presbyterian next, and the CTS student least, but still scoring a full standard deviation above the mean of the general population. The other differences are slighter. Indeed, one can say that the same type of profile pattern found in the normative studies of United Presbyterian and Southern California School of Theology seminarians is found in the norms for students at Christian Theological Seminary; that this pattern is sufficiently different from the general population norms to make it imperative that it be taken into account in the interpretation of individual profiles of seminary students; but that these three Protestant profile patterns are so similar that strictly local norms would seem unnecessary. A cooperative study,

using students from many seminaries might profitably develop "Protestant Seminary Norms."

An interpretation of the meaning of this profile pattern is beyond the purview of this thesis, but some comments might be made. The elevations on Hs, Pd, Pt, and Sc may be due to the elevation on K and an effect of K correction. The T scores on these scales without K corrections are more nearly, or entirely, normal: The raw score of 4.47 on Hs = T score of 50; 15.83 on Pd, T score of 55; 10.06 on Pt, T score of 50; 9.15 on Sc, T score of 49.¹² With K correction eliminated, then, the true elevations seem to be on Hy, Mf, Pa, Ma, and Pd. Item analyses of these scales, plus K, would seem to be profitable to try to determine just what personality factors are responsible for the elevations, or whether it is due to certain items that apply in a special way to seminary students, as Bier found with Catholic seminarians.¹³

An item analysis of the K scale with seminary students is presently being done at Michigan State University,¹⁴ but

¹²W. G. Dahlstrom and G. S. Welsh, An MMPI Handbook (Minneapolis, University of Minnesota Press, 1960), p. 460.

¹³Bier, op. cit., pp. 604-609.

¹⁴MSB Newsletter, February, 1965, p. 2.

the writer knows of no other. Since the peak score for seminarians seems to be on Mf, it would be a good scale to analyse. This is particularly true since probably 20 per cent of seminary students have scores above a T score of seventy. Davis suggests that high scores on all of three scales would suggest a pattern of homosexuality: T score of seventy or above on Mf, raw score of thirty-one on Sv, and a raw score of twelve or above on HSX.¹⁵ But the fact that several subscales have been separated out of the Mf scale shows that several different factors may contribute to high scores, and that persons may have identical scores by endorsing different subsets of items. The subscales of Mf include: Personal and emotional sensitivity, fifteen items; Sexual identification, six items; Altruism, nine items; Feminine occupational identification, seventeen items; Denial of masculine occupations, ten items.¹⁶ Indeed, according to Aaronson, Mf correlates highly with intelligence (.26 was the correlation found for the experimental group of this study), and highly with socio-economic status, and, in general, high

¹⁵Davis, op. cit., p. 15.

¹⁶Dahlstrom and Welsh, op. cit., p. 460.

Mf scores in males means that they are interested in people as opposed to being interested in things. He advises caution in diagnosing homosexuality from this scale, quoting Meehl as stating that a T score of eighty is "suspicious", and a T score of ninety, a "secure" diagnosis.¹⁷ Various divergent conclusions are also expressed by other authorities.¹⁸ Furthermore, items may apply in a different way to seminary students, as two items on the HSX scale, developed on prison populations, are, "I pray several times every week," and "I go to church almost every week" -- "True" answers on each of which contribute to a high homosexuality score! All the above would underline the need of an item analysis, and particularly, the necessity of taking special norms for seminary students into consideration in the interpretation of individual MMPI

¹⁷Bernard Aaronson, in a series of lectures on the MMPI, given at Indiana University Medical Center, n. d.

¹⁸Dahlstrom and Welsh, op. cit., pp. 308-318; G. S. Welsh and W. G. Dahlstrom, Basic Readings on the MMPI in Psychology and Medicine, (Minneapolis, University of Minnesota Press, 1956), p. 375; H. C. Modlin, "A Study of the MMPI in Clinical Practice," in Basic Readings, pp. 390-391; A. L. Benton, "The MMPI in Clinical Practice," in Basic Readings, pp. 404-405; H. G. Gough, "Diagnostic Patterns on the MMPI" in Basic Readings, pp. 345-46.

profiles.

Norms for the eleven research scales also scored by National Computer Systems and plotted on their profile report forms were also found. Table VI shows the means and standard deviations of the experimental, crossvalidation, and norm groups on these scales, while Figure 5 visualizes these in graphic form as plotted on the usual profile report form. Some of these scales were developed for and found useful in a medical setting, as Lb (Low back pain, functional), found to discriminate between patients complaining of low back pain whose pain was functional and those whose pain was organic in origin; and Ca (Caudality), useful in indicating the possible presence of a certain type of brain lesion. Cn (Control) was developed to differentiate between psychiatric patients who need to be hospitalized and those who, while having equally deviant profiles and seeming equally disturbed, may be able to maintain themselves outside the hospital--or the locked ward of the hospital. Its usefulness with normal, seminary students is not certain. Full-scale discussions and articles on these and the other eight research scales are found in Basic Readings on the MMPI in Psychology and Medicine.¹⁹

¹⁹Welsh and Dahlstrom, op. cit., pp. 187-255 and 264-282.

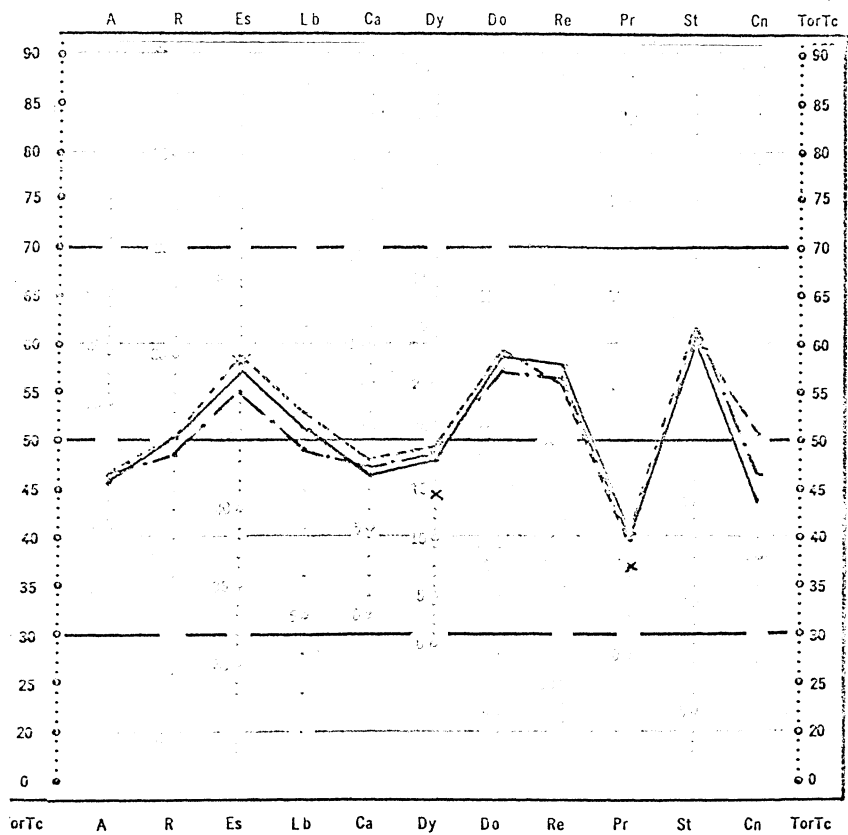
TABLE VI

MEANS AND STANDARD DEVIATIONS OF THE EXPERIMENTAL,
CROSSVALIDATION, AND CTS NORM GROUPS ON THE
RESEARCH SCALES OF THE MMPI

Scale	Experimental Group		Crossvalidation Group		Norm Group	
	Mean	SD	Mean	SD	Mean	SD
A	9.43	7.43	8.91	6.96	8.82	7.81
R	15.72	3.90	14.91	3.43	15.64	3.35
Es	49.89	5.31	47.50	5.59	48.48	4.15
Lb	9.94	2.67	9.03	2.22	9.51	2.03
Ca	8.68	5.26	8.16	4.21	7.81	4.27
Dy	18.74	8.45	18.47	8.72	18.00	7.75
Do	19.15	3.01	17.53	3.39	17.93	2.75
Re	22.70	2.66	23.02	3.12	23.27	2.82
Pr	6.28	3.68	6.34	3.56	6.66	4.38
St	22.21	3.36	22.84	3.30	22.12	2.59
Cn	25.17	4.66	23.47	4.46	22.23	4.34
	N = 47		N = 32		N = 76	

The other eight scales are more useful. No other Protestant seminary norms are available on them, except Presbyterian norms on Es, Dy, and Pr, which are included in the thirty-four auxiliary scales. Do, Re, and St, as included in the auxiliary scales, are the revised forms. So the basic comparison, as shown in Figure 5, is with general population norms, except where the Presbyterian mean scores on the three available, Es, Dy, and Pr, are indicated by an "x".

Examination of the profile shows that the seminary students tend to have a characteristic profile on these scales too, the profiles of the norm, experimental, and cross-validation groups showing very little variation. The A and R scales are usually used together. "High A scores are related to disability of a dysthymic and dysphoric nature in which anxiety is prominent. The disorders exhibited by high R scorers are characterized by repression and denial; low R accompanies externalized and 'acting out' behavior...It is not argued that A is a direct measure of anxiety and R of repression...Among diagnostic groups anxiety states fall high on A; but of those with high A scores who are also high on R, depression will be seen primarily, while those low on



Norm _____ Crossvalidation -----
 Experimental ----- Presbyterian x

Figure 5. Mean profile on the Research scales of the MMPI for the experimental, crossvalidation, and norm groups of CTS, and the Presbyterian means on Es, Dy, and Pr.

R will show schizoid features."²⁰ CTS students score low on A and average on R, showing little anxiety with or by the use of average amounts of denial and repression.

Originally designed to predict the response of psychoneurotic patients to therapy, the Es scale is useful in giving "an estimate of adaptability and personal resourcefulness," or "ego strength." High scores indicate characteristics of "physiological stability and good health, a strong sense of reality, feelings of personal adequacy and vitality, permissive morality, lack of ethnic prejudice, emotional outgoingness and spontaneity, and intelligence," evident or latent in the personality.²¹ CTS students average almost a standard deviation above the mean on Es, for a T score of 58, which means that they possess these characteristics to a higher degree than the average person.

The Dy scale was designed to be a measure of direct

²⁰G. S. Welsh, "Factor Dimensions A and R," Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, University of Minnesota Press, 1956), p. 280.

²¹F. Barron, "An Ego-Strength Scale Which Predicts Response to Psychotherapy," Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, University of Minnesota Press, 1956), pp 226-233.

and manifest dependence, and while Dahlstrom and Welsh feel there is a need for more information on this measure, it seems to be useful.²² CTS students seem to be a little less dependent than average.

The "Dominance" of the Do scale does not mean "domineering," but is supposed to be a measure of social initiative, leadership ability, persistence, and strong and forceful actions.²³ The mean score for CTS students is almost a full standard deviation above the general mean, for a T score of 59. For ministers, who are in a leadership role, this is a very favorable, perhaps even a necessary, trait.

One might expect seminary students to score high on the Re (Social Responsibility) Scale, as indeed they do, for a T score of 58. The Re scale indicates "willingness to take the consequences of one's own behavior and trustworthiness, dependability, and a sense of obligation to the group."²⁴

The Pr (Prejudice) scale was designed to measure anti-semitism and prejudice in general. Several personality

²²W. G. Dahlstrom and G. S. Welsh, An MMPI Handbook (Minneapolis, University of Minnesota Press, 1960), p. 376.

²³Ibid., p. 360-61.

²⁴Ibid., p. 360.

trends were found to be characteristic of more prejudiced students. The high Pr person is "harrassed, tormented, resentful, peevish, querulous, constricted, disillusioned, embittered, distrustful, rancorous, apprehensive, and somewhat bewildered."²⁵ Understandably, the CTS mean is over a full standard deviation below the general population mean, for a T score of 39. The average Presbyterian seminarian seems to be a little less prejudiced yet.

On the theory that personality is affected by social status, the St (Social Status) scale was designed to measure socioeconomic status by means of items from the MMPI that make no mention of status. The items selected fall into five groups: "literary-esthetic attitudes; social poise, security, confidence in self and others; denial of fears and anxieties; 'broadminded,' 'emancipated,' and 'frank,' attitudes toward moral, religious, and sexual matters;

²⁵H. G. Gough, "A Personality Scale for Anti-Semitic Prejudice (Pr)", Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, University of Minnesota Press, 1956), p. 210.

and positive, dogmatic, and self-righteous opinions."²⁶ The last two groups seem contradictory, and either could contribute to a high score. In any case, CTS students score highest of all on this scale, for a T score of 62.

These scales are discrete, and do not show the inter-relationship of the clinical scales, so profile configuration as such does not have the same importance as for the clinical scales. However, the traits that seem to be characteristic of CTS students are quite positive and favorable.

II. EXPERIMENTAL SCALES

In contrast to the clinical scales, the thirty-four auxiliary scales are considered experimental, and are in the process of being studied for possible usefulness. Therefore, they will not be considered in detail. Short descriptions of these scales are found in Appendix A.

Except for the three also included in the research scales, Es, Pr, and Dy, plus the At scale, general population

²⁶H. G. Gough, "A Scale for a Personality Dimension of Socioeconomic Status (St)", Basic Readings on the MMPI in Psychology and Medicine, G. S. Welsh and W. G. Dahlstrom, eds. (Minneapolis, University of Minnesota Press, 1956), p. 197.

norms on these scales are not easily available. The Handbook lists the items and the scoring direction, but no norms.²⁷ So the norms found by Davis for United Presbyterian seminarians are used, and the profile form found in Supplement II of his Guide for Counseling Prospective Church Workers is used for recording the individual profiles of CTS students. The mean profile of the CTS norm group is plotted on this form in Figure 6. It must be kept in mind that the comparison is between the two seminary norms, and that the norms for the general population may be different in many respects. That this is likely is shown by a comparison with the three included in the research scales. The United Presbyterian mean score of 49.79 on Es has a T score of 59 according to general population norms; the score of 14.62 on Dy, a T score of 45; and the score of 4.62 on Pr, a T score of 37.

The means and standard deviations of the United Presbyterian and CTS norm groups are presented in Table VII, except for those of the HSX and Sv scales, which are not given on the United Presbyterian form. The differences between the means are also listed. Eighteen of the differences are less

²⁷Dahlstrom and Welsh, op. cit., pp. 448-468.

Scale No.	Abbrev.	# Items	Scale Name	-2 SD	-1 SD	M	+1 SD	+2 SD
				30	40	50	60	70
2	Ac	18	Academic achievement	12	13	14	15	16
4	Ae	26	College achievement	8	9	10	11	12
16	At	50	Iowa manifest anxiety	10	11	12	13	14
	HSX	22						
47*	De	12	Delinquency	6	5	4	3	2
50*	Do-r	16	Dominance	8	9	10	11	12
57*	Dy	57	Dependency		25	20	15	10
58	Ec	41	Escapism	10	15	14	13	12
59	Em	48	Emotional immaturity	15	14	13	12	11
60	Eo	23	Ego overcontrol	19	18	17	16	15
62*	Es	68	Ego strength	41	42	43	44	45
71*	Gr	14	Graduate school potential	7	8	9	10	11
74	Hc	34	Hostility control	9	8	7	6	5
78*	Hr	16	Honor point ratio	9	10	11	12	13
92*	Ie	39	Intellectual efficiency	28	29	30	31	32
93*	Im	21	Impulsivity	11	10	9	8	7
106*	Lp	50	Leadership		30	35	40	45
124	Mp	33	Malingering	7	8	9	10	11
131	No	18	Neurotic overcontrol	9	8	7	6	5
134	Nu	33	Neurotic undercontrol	18	17	16	15	14
135*	Or	25	Originality	8	9	10	11	12
162*	Pr	32	Prejudice	11	10	9	8	7
167	Pv	50	Pharisaic virtue		25	20	15	10
174*	Re-r	20	Social responsibility, rev.	13	14	15	16	17
176	Rg-m	10	Rigidity, male	8	7	6	5	4
177*	Rp	32	Role playing	20	21	22	23	24
189	Sf	34	Self-sufficiency	18	19	20	21	22
195	So-r	39	Social desirability, rev.	29	30	31	32	33
196*	Sp	25	Social participation	16	17	18	19	20
200	St-r	19	Social status, rev.	9	10	11	12	13
201**	Sv	100	Sexual deviation					
205*	To	30	Tolerance	19	20	21	22	23
206	Tp	98	Teaching potentiality	60	65	70	75	80
210	Un	22	Underachievement	15	14	13	12	11

Figure 6. CIS means on MMPI experimental scales compared with United Presbyterian norms.

TABLE VII

COMPARISON OF MMPI AUXILIARY SCALE NORMS FOR CTS
AND PRESBYTERIAN SEMINARY MALE STUDENTS

	Presbyterian Seminary*		Christian Theological Seminary		Difference between M's
	M	SD	M	SD	
Ac	15.84	1.72	15.27	1.79	.57
Ae	14.00	2.66	13.59	2.77	.41
At	8.78	5.88	11.69	7.04	2.91
Hsx	**	**	12.25	2.31	
De	2.36	1.40	2.59	1.42	.23
Do-r	11.59	1.72	10.88	2.62	.71
Dy	14.62	5.91	17.93	7.83	3.31
Ec	9.96	2.55	10.39	3.05	.41
Em	7.89	3.31	8.68	4.76	.79
Eo	12.70	2.94	12.43	3.09	.27
Es	49.79	3.97	48.84	4.66	.95
Gr	11.26	1.70	9.99	2.40	1.27
Hc	4.56	2.05	5.57	2.49	1.01
Hr	12.94	1.73	12.44	1.83	.50
Ie	34.10	2.58	32.49	3.11	1.61
Im	5.50	2.60	5.95	2.89	.45
Lp	39.54	4.96	36.88	6.51	2.66
Mp	15.35	4.10	16.03	4.04	.68
No	3.87	2.08	4.00	2.43	.13
Nu	8.76	4.46	9.43	4.50	.67
Or	12.81	2.26	11.55	2.45	1.26
Pr	4.62	3.06	6.47	4.03	1.85
Pv	14.32	6.02	17.49	6.26	3.17
Re-v	16.86	1.82	16.56	1.88	.30
Rg	4.82	1.10	5.24	1.21	.42
Rd	23.29	1.37	22.42	2.95	.86
Sf	26.87	3.96	24.07	5.54	2.80
So-r	35.64	3.17	33.15	5.02	2.49
Sp	20.33	2.04	19.09	3.51	1.24
St-r	13.20	1.91	12.55	2.07	.65
Sv	**	**	29.33	7.11	
To	25.44	2.88	23.76	3.86	1.68
Tp	22.19	10.45	77.90	12.34	4.28
Un	11.19	1.69	11.56	1.78	.37

*From Guide for Counseling Prospective Church Workers,
by C. E. Davis, Pittsburgh, Board of Christian Education,
United Presbyterian Church, 1963.

** Not given

than one point, and only seven are greater than two score points. The largest difference is on Tp (Teaching Potential), where means are 82.19 and 77.90 for the Presbyterian and CTS groups respectively, so the difference of 4.28 is not large proportionately. So it would seem again that there is perhaps a pattern fairly characteristic of seminary students.

More will be said about many of these scales in Chapter V, when the predictive aspects of the study will be considered.

CHAPTER V

RESULTS: PREDICTIVE VALIDITY

The second purpose of this study was to see whether any one or several of the scales of the MMPI could predict ministerial effectiveness as measured by (a) grade point average for two semesters of seminary work, (b) peer ratings, and (c) faculty ratings using the Ministerial Effectiveness Rating Scale. As described in detail in Chapter III, the BMD 29 program was used on the 7090 Computer at Purdue University to compute the appropriate multiple regression and correlation analyses. The results of these analyses, the simplified regression equations found, and the results of the crossvalidation studies form the subject matter of this chapter.

In brief, the procedure was to use the results of the analyses, to select the variables which met three further restrictions, and to use a Wherry-Doolittle test selection procedure with these to calculate a simpler regression equation.¹

¹Henry E. Garrett, Statistics in Psychology and Education (New York, Longmans, Green and Co., 1958), pp. 426-40.

This regression equation was used to predict the criterion scores of the crossvalidation group, and the coefficient of correlation between predicted and achieved scores found and tested for significance. The regression equations found and the results of the crossvalidations will be considered for each criterion measure in turn: grade point average, peer ratings, and faculty ratings. But first it will be important to establish the comparability of the experimental and cross-validation groups.

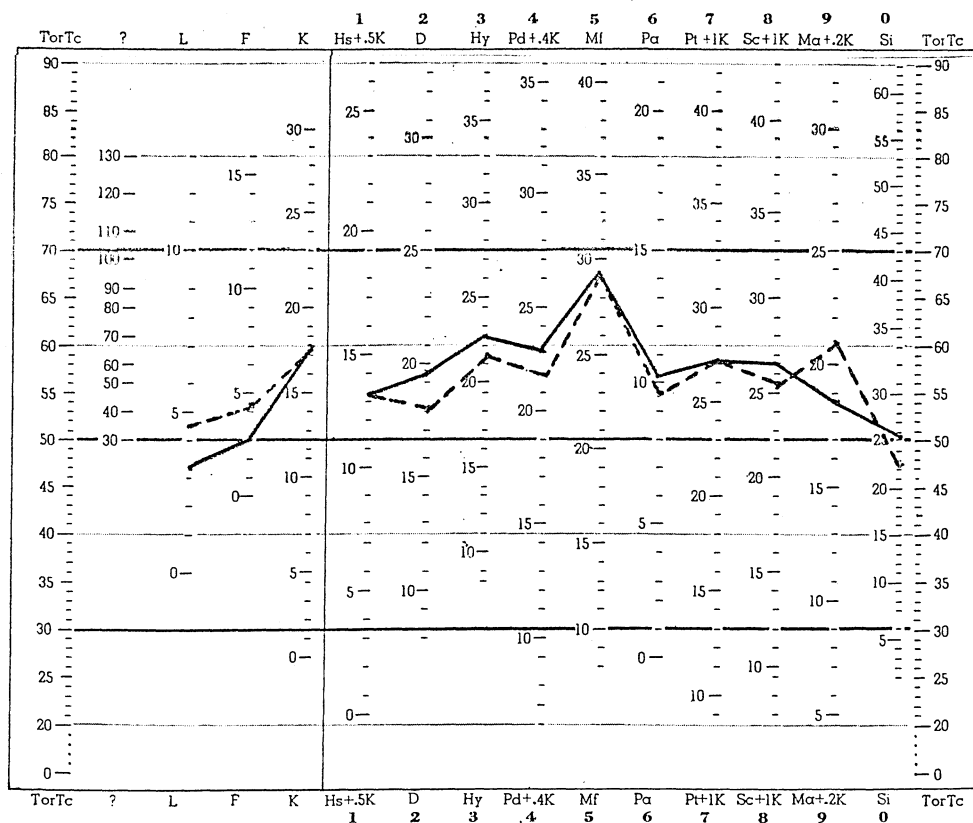
Comparison of the experimental and crossvalidation groups.

For valid crossvalidation, the new group must be equivalent to the experimental group in all important respects. Both groups were students at Christian Theological Seminary. Important ways in which they might differ could be age, denominational affiliation, and in the means of their scores on the predictor variables, the scales of the MMPI. The average age of the experimental group was 27.66, and that of the crossvalidation group was 27.63--a difference of about ten days, obviously not a significant difference. In denominational background, the forty-seven subjects of the experimental group included thirty-four Disciples, nine Methodists, three Baptists, and one Presbyterian. The crossvalidation group of thirty-two included

twenty Disciples, eight Methodists, one Baptist, one Presbyterian, one from the United Church of Christ, and one from the United Church of Canada. Both groups, then, were roughly equivalent, both being heterogeneous as to denominational affiliation, but with about two-thirds Disciples students.

Examination of the profiles of the two groups on the clinical scales of the MMPI as shown in Figure 7 indicates that they are almost identical on K, Hs, Mf, and Pt. The crossvalidation group has slightly higher means on L, F, and Ma, and slightly lower means on D, Hy, Pd, Pa, and Si, the greatest differences being on L and Ma. To determine whether any of these differences were significant, the significance of the difference between the means was calculated for each scale, first using the formula for the standard error of the difference of uncorrelated means, then finding the critical ratio and testing it for significance.² In Table VIII are shown the means and standard deviations of the two groups on the clinical scales of the MMPI, the differences between these means, and the critical ratio of each difference. Most of the differences are negligible, and only two were found to be

²Ibid, pp. 213-17.



Experimental _____ Crossvalidation - - - - -

Figure 7. Mean profiles of the experimental and crossvalidation groups on the clinical scales of the MMPI.

TABLE VIII

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE MEANS
OF THE EXPERIMENTAL AND CROSSVALIDATION GROUPS

Scale	Experimental Group		Crossvalidation Group		Difference	CR
	Mean	SD	Mean	SD		
L	3.26	1.94	4.47	2.42	1.21	2.33 ¹
F	3.00	2.50	4.28	3.45	1.28	1.79
K	17.17	4.51	17.34	4.34	.17	.16
Hs+.5K	13.26	3.58	13.13	3.91	.13	.15
D	19.32	4.89	18.09	3.69	1.23	1.27
Hy	22.51	4.21	21.41	4.50	1.10	1.10
Pd+.4K	22.74	3.69	21.94	2.86	.80	1.08
Mf	29.28	5.21	29.13	4.70	.15	.13
Pa	10.17	2.49	9.63	2.28	.54	1.00
Pt+1K	27.28	5.05	27.28	3.89	.00	.00
Sc+1K	26.45	5.22	25.50	3.77	.95	.94
Ma+.2K	18.60	3.82	21.06	3.45	2.46	2.98**
Si	25.21	9.57	22.50	8.21	2.71	1.33
<hr/>						
Age	27.66		27.63			
	N = 47		N = 32			
<hr/>						

* Significant at the .05 level CR \geq 1.96

** Significant at the .01 level CR \geq 2.58

¹ Significant at the .02 level CR \geq 2.33

significant, L at the .02 level and Ma at the .01 level.³

All considered, the two groups can be accepted as equivalent on all but these two scales.

Intercorrelations. The basis for the Wherry-Doolittle test selection procedure is the correlation matrix, so one of the early steps in the multiple regression and correlation analysis is the calculation of the coefficients of correlations between all variables, both dependent and independent. The complete tables of intercorrelations between all variables are found in Appendix B, but Table IX lists the correlations between the criteria measures and the scales of the MMPI plus the Language, Non-language, and Total Mental Factors of the California Test of Mental Maturity, and the intercorrelations of the criteria themselves. For an N of forty-seven, with therefore forty-five degrees of freedom, a correlation of .288 is significant at the .05 level, of .340 at the .02 level, and of .372 at the .01 level.⁴ Some of the correlations

³E. F. Lindquist, A First Course in Statistics (New York, Houghton Mifflin Co., 1942), p. 132.

⁴Garrett, op. cit., p. 201.

were .28, just short of significance.

It is easily noted from Table IX that the highest correlations with GPA are CTMM Language Factor, .48**; CTMM Total Mental Factors, .46**; MMPI Mf, .36'; CTMM Non-language, .29*; and MMPI Sc+K, .28 (almost significant); and MMPI Experimental scales, Or, .29*; and ReR, .28. The highest correlations with peer ratings are Ma+K, .34'; and Ma without K correction, .28; next highest, but not significant is CTMM Language Factor, .24. None of the experimental scales correlates significantly with peer ratings. As to faculty ratings, the highest correlations are Cn, .32*; Ma+K, .31*; Ma without K, .30*; and next highest, but not significant, are Pa, -.25; Do, .24; and CTMM Language Factor, .24.

It is interesting to note that the intelligence scores are not significantly correlated with either faculty or peer ratings, but that grade point average is significantly correlated with faculty ratings, .36', and almost so with peer ratings, .28. Both faculty and peers seem to be impressed with actual classroom performance, then, and with a high energy and ambition level as shown by higher Ma+K scores. Faculty and peer ratings are significantly correlated, .34'.

Of the scales designed to predict academic achievement,

TABLE IX

CORRELATIONS BETWEEN THE SCALES OF THE CTMM, THE CLINICAL,
RESEARCH AND EXPERIMENTAL SCALES OF THE MMPI
AND THE CRITERION MEASURES

Scale	FAC	PEER	GPA	Scale	FAC	PEER	GPA
LF	.24	.24	.48**	Ac	.03	.03	.12
NL	.24	.10	.29*	Ae	-.16	.05	-.14
TM	.19	.22	.46**	At	-.02	-.16	.05
L	-.14	.01	-.17	Hsx	-.18	.05	-.17
F	.04	-.03	.03	De	-.14	-.12	-.10
K	.01	.13	.02	Do	.14	.06	.06
Hs	-.20	-.15	-.07	Dy	.04	-.16	.05
Hs+K	-.20	-.05	-.04	Ec	.10	.02	.23
D	.04	-.13	-.15	Em	.03	-.06	.02
Hy	-.04	.07	-.05	Eo	-.18	-.05	.01
Pd	.01	-.09	-.11	Es	.17	.15	.15
Pd+K	.03	-.02	-.09	Gr	-.10	.02	-.07
Mf	.07	-.01	.36'	Hc	-.05	-.06	.06
Pa	-.25	-.21	.15	Hr	.04	.10	.02
Pt	.08	-.06	.04	Ie	.04	.00	.14
Pt+K	.11	.04	.06	Im	.07	-.06	.07
Sc	.11	.06	.21	Lp	.07	.05	-.03
Sc+K	.14	.20	.28	Mp	-.00	.10	-.12
Ma	.30*	.28	.21	No	-.10	.02	.04
Ma+K	.31*	.34'	.21	Nu	.17	-.11	.02
Si	-.09	-.02	.07	Or	-.14	-.10	.29*
A	.08	-.15	-.01	Pr	.06	.12	-.03
R	.22	-.08	.07	Pv	-.08	-.20	-.02
Es	.19	.14	.16	Re	.03	-.00	.28
Lb	.08	.19	-.20	Rg	-.04	-.03	-.02
Ca	-.02	-.20	-.04	Rp	.02	.08	-.24
Dy	.04	-.16	.05	Sf	-.08	.18	-.12
Do	.24	.10	.24	So	.02	.08	-.11
Re	-.04	.01	.13	Sp	.10	-.03	.08
Pr	.06	.12	-.03	St	.19	.06	-.03
St	.18	.19	.10	Sv	-.20	-.06	-.02
Cn	.32*	.06	.22	To	-.01	-.09	.04
FAC		.34'	.36'	Tp	-.08	.01	-.07
PEER			.28	Un	-.13	-.26	-.18
				FAC		.34'	.36'
				PEER			.28

N = 47

*Significant at the .05 level: $\geq .288$ ** Significant at the .01 level: $\geq .372$ 'Significant at the .02 level: $\geq .340$

only Or, Originality, had any significant correlation with the grade point average, .29*. Academic Achievement had a correlation of only .12, College Achievement of -.14; Graduate School Potential, -.07; Honor Point Ratio, .02; Intellectual Efficiency, .14; and Underachievement, -.18. This correlation with the Or scale seems to bear out Gough's predication of a "significant shift in the psychological processes involved in academic success from high school, where conformity is given high weighting, to college, or more clearly graduate school, where success through independence and originality is given increasingly greater emphasis."⁵

I. GRADE POINT AVERAGE PREDICTED

Multiple regression and correlation analyses with grade point average were done with the clinical scales, the research scales, then both together, and with the experimental, or auxiliary scales. The complete data of the analyses of variance for regression are found in Tables XXIII to XXVI in Appendix B, but part of the data is reproduced in tables in this section. Each such table includes the degrees

⁵W. Grant Dahlstrom and George Schlager Welsh, An MMPI Handbook (Minneapolis, University of Minnesota Press, 1960), pp. 251-52.

of freedom due to regression (the number of independent variables or scales of the MMPI), and due to deviation about regression ($N - 1 -$ the number of independent variables), and the total, which is N minus one; the sums of squares, and the mean squares (the sums divided by the degrees of freedom); and the F value for the entire set of variables. The information in the body of the tables includes the means and standard deviations of each variable, the coefficient of correlation between each and the criterion, the regression coefficient, the F values of the variables included at each point, and the multiple correlation of these with the criterion. The F values for the appropriate degrees of freedom were checked for significance in the tables of F values in Garrett⁶ and Ostle,⁷ and the .05 level is indicated by one asterisk (*) and the .01 level by two asterisks (**). The regression equation as calculated by the computer included all the variables, and though often most of the variables had a significant F value, the entire set did not. Such a large number of scales in an

⁶Garrett, op. cit., pp. 451-54.

⁷Bernard Ostle, Statistics in Research (Ames, Iowa State University Press, 1963), pp. 529-43.

equation is completely unwieldy for practical purposes, and the standard error of estimate would make the possibility of significant prediction most improbable. So three further restrictions were accepted for choosing three or four variables for the simpler regression equation, as described in Chapter III. In each case the simpler equation was used to predict the grade point average for the crossvalidation group, and the coefficient of correlation between predicted and achieved GPA calculated and tested for significance.

Clinical and research scales. Tables X, XI, and XII present the data of the analyses of variance for regression of the clinical, the research, and the clinical and research scales together with grade point average. In Table X, the clinical scales with GPA, the first variable chosen was Mf, with a simple and multiple correlation of .36, significant at the .02 level, and almost at the .01 (.01 = .372 for 45 degrees of freedom). When D, negatively weighted, was added, the multiple R was increased to .46244, and the F value was significant at the .01 level. The addition of Sc+K, positively weighted, raised the multiple R to .55183, and of Pd (without K correction), negatively weighted, increased R to .57744, a lesser increase. Each addition increased the

TABLE X

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL SCALES WITH GPA

Source of Variation		D.F.	S.S.	M..S.	F Value
Due to Regression		18	5.25613	0.29201	1.71088
Deviation about Regression		28	4.77894	0.17068	
Total		46	10.03507		

Intercept (A Value) is 1.09231							
No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
13	CLNMF	29.28	5.21	.36	0.03965	6.71704*	0.36039
9	CLND	19.32	4.88	-.15	-0.02227	5.98466**	0.46244
18	CLNSCK	26.45	5.22	.28	0.02071	6.27568**	0.55183
11	CLNPD	15.83	3.40	-.11	-0.08480	5.25242**	0.57744
10	CLNHY	22.51	4.21	-.05	-0.02012	4.53709**	0.59683
14	CLNPA	10.17	2.49	.15	0.02271	3.94185**	0.60957
7	CLNHS	4.47	3.59	-.07	-0.51863	3.34859**	0.61270
4	CLNL	3.26	1.94	-.17	-0.02823	2.90400**	0.61596
8	CLNHSK	13.26	3.58	-.04	0.50653	2.57821*	0.62082
6	CLNK	17.17	4.51	.02	0.26357	2.60117*	0.64766
19	CLNMA	15.13	3.92	.21	0.43635	2.33349*	0.65046
20	CLNMAK	18.60	3.82	.21	-0.41527	2.54645*	0.68799
15	CLNPT	10.06	7.07	.04	0.25570	2.30572*	0.68991
16	CLNPTK	27.22	5.05	.06	-0.41500	2.47641*	0.72113
5	CLNF	3.00	2.50	.03	0.01272	2.26571*	0.72317
12	CLNPK	22.74	3.69	-.09	0.05423	2.06140*	0.72366
17	CLNSC	9.15	6.16	.21	0.00651	1.87600	0.72370
21	CLNSI	25.21	9.57	.07	-0.00072	1.71088	0.72372

Dependent

35	GPA	2.85	0.47				N = 47
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multiple R, until with all eighteen variables, it is .72372, but the F value is significant only through the first sixteen.

With the research scales, as shown in Table XI, the highest simple correlation was with Do, Dominance, the first chosen variable, .24405. No F values were significant, so the research scales alone, so far as this study is concerned, show no probability of being able to significantly predict GPA. It is interesting to note that Webb and Goodling also found Dominance significantly correlated with grades at the end of the first year at Chandler.⁸

When the clinical and research scales were combined in an analysis, the order of variables was changed from that of the clinical scales alone, as can be seen in Table XII. Mf was still the first variable chosen, but the next was Es, with a correlation with the criterion of .16. This is less than several others, but with a negative correlation of -.39 with Mf, Es added more unique variance. The multiple R was raised to .48949, and the F value is significant at the .01 level.

⁸S. C. Webb and R. A. Goodling, "Test Validity in a Methodist Theological School, " Educational and Psychological Measurement, 18, 1958, pp. 859-866.

TABLE XI

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI RESEARCH SCALES WITH GPA

Source of Variation		D.F.	S.S.	M.S.	F Value
Due to Regression		11	2.75822	0.25075	1.20604
Deviation about Regression		35	7.27685	0.20791	
Total		46	10.03507		

Intercept (A Value) is -0.88125							
No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
28	RESDO	18.15	3.01	.24	0.05018	2.84990	0.24405
27	RESDY	18.74	8.45	.05	0.01472	3.00391	0.34661
23	RESR	15.72	3.90	.07	0.02594	2.59911	0.39179
24	RESSES	49.89	5.31	.16	0.00824	2.53382	0.44091
25	RESLB	9.94	2.67	-.20	-0.03601	2.26423	0.46516
30	RESPR	6.28	3.68	-.03	0.03358	1.98888	0.47935
29	RESRE	22.70	2.66	.13	0.06031	1.84271	0.49854
32	RESO	25.17	4.66	.22	0.03332	1.73225	0.51694
26	RESCA	8.68	5.26	-.04	-0.01114	1.53306	0.52117
31	RESST	22.21	3.36	.10	-0.00902	1.36177	0.52383
22	RESA	9.43	7.43	-.01	-0.00415	1.20604	0.52427

Dependent			
35	GPA	2.35	0.47

N = 47

TABLE XII

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL & RESEARCH SCALES WITH GPA

Source of Variation		D.F.	S.S.	M.S.	F Value
Due to Regression		29	6.90732	0.23818	1.29458
Deviation about Regression		17	3.12775	0.18399	
Total		46	10.03507		

Intercept (A Value) is -2.64953							
No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
13	CLNMF	29.28	5.21	.36	0.03058	6.71704*	0.36039
24	RESES	49.89	5.31	.16	0.03277	6.93229**	0.48949
18	CLNSCK	26.45	5.22	.28	-0.01418	6.32158**	0.55322
25	RESLB	9.94	2.67	-.20	-0.07394	7.19234**	0.63759
9	CLND	19.32	4.89	-.15	-0.04203	6.86227**	0.67498
23	RESR	15.72	3.90	.07	0.04564	6.33923**	0.69815
32	RESCN	25.17	4.66	.22	0.01361	6.69143**	0.73869
14	CLNPA	10.17	2.49	.15	0.02238	6.12561**	0.75050
12	CLNPK	22.74	3.69	-.09	-0.05571	5.81251**	0.76533
28	RESDO	18.15	3.00	.24	0.05196	5.29016**	0.77140
15	CLNPT	10.07	7.07	.04	0.02641	5.05759**	0.78347
8	CLNHSK	13.26	3.58	-.04	0.33802	4.64765**	0.78820
30	RESPR	6.28	3.68	-.03	0.03508	4.33436**	0.79414
20	CLNMAK	18.60	3.82	.21	-0.17171	4.09628**	0.80116
7	CLNHS	4.47	3.59	-.07	-0.31245	3.87979**	0.80775
17	CLNSC	9.15	6.16	.21	0.04182	3.78627**	0.81780
19	CLNMA	15.13	3.92	.21	0.19685	3.59498**	0.82352
27	RESDY	18.74	8.45	.05	-0.00826	3.31296**	0.82492
29	RESRE	22.70	2.66	.13	0.01371	3.05258**	0.82604
31	RESST	22.21	3.36	.10	-0.00890	2.81742*	0.82720
22	RESA	9.43	7.43	-.01	0.01117	2.60603*	0.82851
6	CLNK	17.17	4.51	.02	-0.02048	2.39501*	0.82889
5	CLNF	3.00	2.50	.03	0.00670	2.28079*	0.82920
4	CLNL	3.26	1.94	-.17	-0.00946	2.02150	0.82947
10	CLNHY	22.51	4.21	-.05	-0.00322	1.85345	0.82954
11	CLNPD	15.83	3.40	-.11	0.03134	1.69841	0.82962
26	RESCA	8.68	5.26	-.04	0.00215	1.55404	0.82965
21	CLNSI	25.21	9.57	.07	-0.00025	1.41969	0.82965
16	CLNPTK	27.28	5.05	.06	0.00053	1.29458	0.82965
Dependent							
35	GPA	2.85	0.47				N = 47

Again, Sc+K was the third variable included, raising multiple R to .55322, but Lb was the fourth, negatively weighted, making the multiple R .63759. The increments in R were less thereafter, for a maximum of .82965 after twenty-seven variables had been included. F values were significant through the first twenty-three.

Applying the three added restrictions to this analysis, the standard error of estimate was reduced very little after the fourth variable (though the first increase came after the ninth), so the first four variables, Mf, Es, Sc+K, and Lb were chosen for the calculation of a new regression equation, using the Wherry-Doolittle test selection procedure. The equation, found first in beta weights, when transformed into score form, was:

$$Y_{GPA} = .035 Mf + .042 Es + .040 Sc+K - .062 Lb - .7132.$$

This battery accounted for forty-one per cent of the variance of the criterion: Mf, 14 per cent, Es, 8 per cent, Sc+K, 13 per cent, and Lb, 7 per cent. The multiple R corrected for chance errors was .6093, and the standard error of estimate was .3703.

The equation was then used with the raw scores on Mf, Es, Sc+K, and Lb to predict the GPA for each subject of the

crossvalidation group. The coefficient of correlation between the predicted and achieved scores was found to be .3034. A correlation of .349 was needed to be significant at the .05 level,⁹ so the equation had not significantly predicted the grade point averages of the crossvalidation group.

Because of the possibility that the error introduced by four scales might have been enough to prevent the prediction from being significant, another regression equation using only the first three, Mf, Es, and Sc+K, was calculated:

$$Y_{GPA} = .038 Mf + .0384 Es + .0262 Sc+K - .867.$$

This battery accounted for 30 per cent of the variance of the criterion; Mf, 15 per cent, Es, 7 per cent, Sc+K, 8 per cent. The corrected multiple R was .5235, and the standard error of estimate of the predicted criterion score was found to be .3979.

This new equation was used with the raw scores of the crossvalidation group on Mf, Es, and Sc+K to predict their GPA scores. The correlation between predicted and achieved scores was found to be .4210, significant at the .02 level, (.02 = .412). So this regression equation was able to predict

⁹Garrett, op. cit., p. 201.

the grade point average of the crossvalidation group significantly.

CTMM added. Since the intercorrelations between the California Test of Mental Maturity Language, Non-language, and Total Mental factors were available, it was questioned whether a combination of IQ as measured by the CTMM and the MMPI could predict better than the MMPI alone. A Wherry-Doolittle test selection procedure, using the CTMM Language factor, and the MMPI Mf, Sc+K, Es, Do, Lb, D, Ma, and Ma+K, was done, and the regression equation calculated. The variables chosen were CTMM Language factor, Mf, and D, and the regression equation was:

$$YGPA = .0119 \text{ CTMM LF} + .031 \text{ Mf} - .0234 \text{ D} + .9437.$$

This battery had a corrected multiple correlation of .5581 with the criterion and accounted for 34 per cent of the variance of the criterion: LF, 18 per cent; Mf, 12 per cent; and D, 4 per cent. The standard error of estimate was .3875. When this equation was applied to the scores of the crossvalidation group, the coefficient of correlation between predicted and achieved scores was .3168, just short of the .05 level of significance.

Once again, one scale was eliminated, D, and the

regression equation found was:

$$YGPA = .0132 \text{ CTMM LF} + .0226 \text{ Mf} + .5791.$$

The shrunken multiple correlation coefficient was .5234, and the battery accounted for 29 per cent of the variance of the criterion; CTMM Language factor, 20 per cent, and Mf, 9 per cent. The standard error of estimate was found to be .3935.

When this regression equation was applied to the scores of the crossvalidation group, the coefficient of correlation between the predicted and achieved scores was .4124, significant at the .02 level, (.02 = .412).

In order to see whether this represented an improvement over prediction using the CTMM Language factor alone, the regression equation for it was found:

$$YGPA = .0153 \text{ CTMM LF} + .9850.$$

The coefficient of correlation between LF and GPA was .48, and the standard error of estimate was found to be .4097.

When this equation was used to predict the grade point averages of the crossvalidation group, the coefficient of correlation between predicted and obtained scores was .4452, significant at the .02 level, and lacking only .004 of reaching the .01 level.

Experimental scales. Part of the data of the analysis

of variance for regression of the experimental, or auxiliary scales of the MMPI with GPA are presented in Table XIII, while the complete analysis is found in Table XXVI in Appendix B. Or, originality, was the first variable chosen, with a correlation of .2878 with the criterion, and an F value significant at the .05 level. Rp, Role-playing, when added, increased the multiple R to .43292, an increase of over .14 points, with an F value significant at the .05 level. The addition of Es, Ego strength, increased the multiple R to .52315, and contributed to an F value significant at the .01 level. The addition of further variables added smaller increments to the R, though the F values remained significant at the .01 level until after twenty-five variables had been included, and significant at the .05 with the addition of five more, with a cumulative multiple R of .89912.

The F values had increased rapidly for the first three variables, then started decreasing rapidly, though significant at the .01 level for the appropriate degrees of freedom. Therefore, the first three, Or, Rp, and Es, were used in a Wherry-Doolittle test selection procedure, and a regression equation calculated:

$$Y_{\text{GPA}} = .056 \text{ Or} - .0789 \text{ Rp} + .030 \text{ Es} + 2.276.$$

TABLE XIII

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI EXPERIMENTAL SCALES WITH GPA

Source of Variation		D.F.	S.S.	M.S.	F Value		
Due to Regression		34	8.17835	0.24054	1.55461		
Deviation about Regression		12	1.85672	0.15473			
Total		46	10.03507				
Intercept (A Value) is					-0.48598		
No.	Name	Mean	SD	Simple Reg. r	Reg. Coef.	F Value	Multiple R
21	EXPOR	12.96	2.37	.29	0.06754	4.06612*	0.28787
26	EXPRP	21.13	3.02	-.24	-0.05776	5.07417*	0.43292
11	EXPES	50.47	5.38	.15	-0.00497	5.40093**	0.52315
12	EXPGR	10.34	2.19	-.07	-0.12130	5.00053**	0.56798
29	EXPSP	18.62	3.39	.08	-0.02058	4.55887**	0.59775
34	EXPUN	11.38	1.60	-.18	-0.15190	4.33237**	0.62760
24	EXPRER	16.53	1.94	.28	0.25520	4.19054**	0.65519
2	EXPAE	14.81	2.68	-.14	-0.08304	4.43829**	0.69501
4	EXPHSX	12.19	1.86	-.17	-0.11426	4.52541**	0.72387
1	EXPAC	15.04	2.18	.12	0.02004	4.16397**	0.73234
32	EXPTO	24.13	3.40	.04	0.10518	4.00385**	0.74646
25	EXPRGM	5.64	1.36	-.02	-0.15835	3.74505**	0.75452
10	EXPEO	11.55	3.24	-.01	-0.14263	3.57119**	0.76454
30	EXPSTR	12.43	1.99	-.03	-0.13308	3.59618**	0.78192
20	EXPNU	10.60	4.69	.02	-0.09404	3.54186**	0.79468
9	EXPEN	10.87	5.53	.02	0.09582	3.45700**	0.80520
17	EXPLP	36.19	6.39	-.03	0.08437	3.72023**	0.82802
7	EXPDY	18.74	8.45	.05	0.03197	3.87142**	0.84461
23	EXPPV	15.74	6.53	.02	0.01926	3.76291**	0.85198
15	EXPIE	32.43	3.46	.14	-0.00420	3.58072**	0.85653
5	EXPDE	2.15	1.41	-.10	0.09691	3.37833**	0.85990
31	EXPSV	27.98	8.39	-.02	0.04906	3.33295**	0.86799
13	EXPHC	5.79	3.14	.06	-0.03874	3.13262**	0.87064
3	EXPAT	13.34	8.05	.05	-0.06869	2.98316**	0.87461
18	EXFMP	12.81	4.20	-.12	-0.03427	2.98046**	0.88325
22	EXPPR	6.28	3.68	-.03	0.15572	2.96447*	0.89105
6	EXPDOR	10.66	2.38	.06	0.08810	2.79257*	0.89372
19	EXPNO	5.74	3.17	.04	0.11401	2.61783*	0.89602
16	EXPIM	6.38	3.01	.07	0.05673	2.42904*	0.89754
14	EXPHR	12.79	1.73	.02	0.05081	2.25041*	0.89912
33	EXPTP	76.62	12.89	-.07	0.01902	2.09733	0.90141
27	EXPSF	23.70	5.82	-.12	-0.02740	2.92224	0.90255
8	EXPEC	11.79	3.77	.23	-0.00542	1.73429	0.90272
28	EXPSOR	32.40	4.95	-.11	-0.00416	1.55461	0.90276
Dependent							
37	GPA	2.85	0.46				N = 47

This battery accounted for 27 per cent of the variance of the criterion; Or, 10 per cent, Rp, 12 per cent; Es, 5 per cent. The multiple R corrected for chance errors was .494, and the standard error of estimate was .4071.

When this equation was used to predict the grade point averages of the crossvalidation group, the coefficient of correlation between the predicted and achieved scores was .4186, significant at the .02 level. This equation, then, was able to predict GPA for the crossvalidation group.

The four equations found to have predictive validity for predicting GPA for students at CTS, arranged in order of highest to lowest correlation between predicted and achieved scores are:

$$Y_{GPA} = .0153 \text{ CTMM LF} + .9850: \quad .4452'$$

$$Y_{GPA} = .038 \text{ Mf} + .0384 \text{ Es} + .0262 \text{ Sc+K} \\ - .867: \quad .4210'$$

$$Y_{GPA} = .056 \text{ Or} - .0789 \text{ Rp} + .030 \text{ Es} \\ + 2.276: \quad .4186'$$

$$Y_{GPA} = .0132 \text{ CTMM LF} + .0226 \text{ Mf} + \\ .5791: \quad .4124'$$

The range of the predicted scores was less than that of the achieved scores in each equation. The range of the achieved scores was from 1.47 to 4.00, while the range of the predicted scores for the equations in the order listed was

2.41 - 3.17 (CTMM LF only); 2.19 - 3.14 (MMPI Clinical Scales); 2.17 - 3.13 (MMFI Experimental Scales); and 2.19 - 3.24 (CTMM LF + MMPI Mf). The range of the predicted scores was restricted because, in each case, the equation was the constant plus what varied from 23 per cent to 30 per cent of the variance of the criterion.

It was interesting to note that in the five cases in which the achieved score was more than .50 grade point lower than the predicted score, as predicted by the equation using MMPI variables only (the second in order as listed above), four of the five students dropped out at the end of the year. Two of these had a GPA of less than 2.00, and had been put on probation. The two who were not on probation re-enrolled the second semester of the next year. The one who did not drop out, even though on probation, had the lowest achieved score and the lowest predicted score, though not the lowest CTMM Language factor score.

II. PEER RATINGS PREDICTED

Essentially the same procedures were followed with peer ratings as with grade point average, except that when ratings are used, some test of interjudge reliability is

needed. In this case, Kendall's Coefficient of Concordance W was used.

Agreement among the ratings. The degree of agreement between the raters as shown by Kendall's Coefficient of Concordance W was tested for both the experimental and cross-validation groups. This relation was tested for significance by computing Chi-square by the formula $X^2 = k(N - 1)W$, with $N - 1$ degrees of freedom. Chi-square for the experimental group was found to be 73.68, with 46 degrees of freedom, significant at the .01 level, and almost at the .001 level (.001 = 74.7).¹⁰ For the crossvalidation group, Chi-square was found to be 65.339, with twenty-nine degrees of freedom, significant at the .001 level (.001 = 58.3). It can be concluded, then, that the judges were "applying essentially the same standard."¹¹

The judges were in even greater agreement in rating the crossvalidation group than those in rating the experimental group. In the experimental group were combined what

¹⁰Ostle, op. cit., p. 525.

¹¹Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York, McGraw-Hill Book Co., 1956), p. 237.

had been two groups for the Spiers study, his "experimental" and "crossvalidation" groups. He had found the degree of agreement as measured by W to be less for the "crossvalidation" group than for the "experimental" group, since the former had been known by the judges for only six or seven months as compared with the latter, who had been known for a year and a half. Therefore, he recommended that peer ratings be done after as long acquaintance as possible.¹² This, then would explain the greater degree of agreement among the raters of the crossvalidation group of this study, after a year and a half of acquaintance.

Prediction by the clinical and research scales. Complete data of the analyses of variance for regression of the clinical, research, and the clinical and research scales together with peer ratings are found in Tables XXVII to XXIX in Appendix B. Part of the data for each is found in tables in this section. A glance at the analysis of variance for regression of the research scales with peer ratings in

¹²Duane E. Spiers, "A Study of the Predictive Validity of a Test Battery Administered to Theological Students" (unpublished Doctor's thesis, Purdue University, January, 1965), p. 109.

in Table XIV shows that the research scales taken alone showed no promise of predictive validity, only one F value, that of the first two variables taken together, being significant at the .05 level. Examination of Tables XV and XVI shows that the same three variables were the first three chosen when the clinical scales were taken alone, and when they were taken together with the research scales.

The first variable chosen was Ma+K, which had a simple correlation coefficient of .34 with the criterion, or more exactly, of .33512, and an F value significant at the .05 level. The first variable added was Pa, with a negative correlation with peer ratings of -.21, increasing the multiple R to .41801. Ma (without K correction) was added next, making the multiple R .45678. These three variables were used in a Wherry-Doolittle test selection procedure, and a regression equation calculated:

$$Y_{\text{PEERAT}} = .2718 \text{ Ma+K} - .0684 \text{ Pa} - .1850 \text{ Ma} + 5.3866.$$

This battery accounted for 21 per cent of the variance of the criterion, with a corrected multiple R of .4224, and a standard error of estimate of .839.

This equation was used with the scores on Ma+K, Pa, and Ma, of the crossvalidation group to predict their peer

TABLE XIV

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI RESEARCH SCALES WITH PEER RATINGS

Source of Variation		D.F.	S.S.	M.S.	F Value
Due to Regression		11	8.27605	0.75237	0.86456
Deviation about Regression		35	30.45820	0.87023	
Total		46	38.73425		

Intercept (A Value) is 3.68255							
No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
26	RESCA	8.68	5.26	-.20	-0.04502	1.85148	0.19879
30	RESPR	6.28	3.68	.12	0.12388	3.39436*	0.36360
25	RESLE	9.94	2.67	.19	0.06831	2.81762	0.40532
31	RESST	22.21	3.36	.17	0.02602	2.58017	0.42988
24	RESES	49.89	5.31	.14	0.03789	1.98481	0.44145
23	RESR	15.72	3.90	-.08	-0.02045	1.67410	0.44801
32	RESCN	25.17	4.66	.06	-0.04628	1.43400	0.45244
28	RESDO	18.15	3.00	.10	0.06269	1.26214	0.45818
22	RESA	9.42	7.43	-.15	0.02095	1.11209	0.46143
29	RESRE	22.70	2.66	.01	-0.01638	0.97807	0.46221
27	RESDY	18.74	8.45	-.16	0.00120	0.86456	0.46224

Dependent

34	PEERAT	6.72	0.92				N = 47
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TABLE KV

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL SCALES WITH PEER RATINGS

Source of Variation	D.F.	S.S.	M.S.	F Value
Due to Regression	18	17.47080	0.97060	1.27810
Deviation about Regression	28	21.26346	0.75941	
Total	46	38.73425		

Intercept (A Value) is 3.70086

No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
20	CLNMAK	18.60	3.82	.34	0.09362	5.69297*	0.33512
14	CLNPA	10.17	2.49	-.21	-0.10550	4.65792*	0.41801
19	CLNMA	15.13	3.92	.28	-0.02016	3.77913*	0.45678
21	CLNSI	25.21	9.57	.02	0.03358	3.55033*	0.50268
12	CLNPDK	22.74	3.69	-.02	0.04153	3.34749*	0.53842
9	CLND	19.32	4.88	-.13	-0.05246	2.94526*	0.55355
15	CLNPT	10.06	7.07	-.06	0.02858	2.64678*	0.56751
7	CLNHS	4.47	3.59	-.15	-1.31536	2.35900*	0.57605
10	CLNHY	22.51	4.21	.07	0.08239	2.37786*	0.60535
8	CLNHSK	13.26	3.58	-.05	1.20202	2.20440*	0.61626
6	CLNK	17.17	4.51	.13	-0.62906	2.52349*	0.66506
5	CLNF	3.00	2.50	-.03	-0.04486	2.28757*	0.66836
4	CLNL	3.26	1.94	.01	0.03718	2.06305*	0.66958
18	CLNSCK	26.45	5.22	.20	0.04291	1.87230	0.67103
11	CLNPD	15.83	3.40	-.09	-0.08808	1.69517	0.67128
17	CLNSC	9.15	6.16	-.06	-0.02395	1.53952	0.67148
16	CLNPTK	27.28	5.05	-.04	0.03795	1.40112	0.67153
13	CLNMF	29.28	5.21	-.01	-0.00226	1.27818	0.67160

Dependent

34	PEERAT	6.72	0.92				N = 47
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TABLE XVI

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL AND RESEARCH SCALES WITH PEER RATINGS

Source of Variation	D.F.	S.S.	M.S.	F Value
Due to Regression	29	29.10873	1.00375	1.77276
Deviation about Regression	17			
Total	46			

Intercept (A Value) is -4.72951

No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
20	CLNMAK	18.60	3.82	.34	0.63423	5.69297*	0.33512
14	CLNPA	10.17	2.49	-.21	0.07163	4.65792*	0.41801
19	CLNMA	15.13	3.92	.28	-0.49559	3.77913*	0.45678
30	RESPR	6.28	3.68	.12	0.23244	4.20681**	0.53483
12	CLNPK	22.74	3.69	-.02	0.75298	4.07454**	0.57615
24	RESES	49.89	5.31	.14	0.06282	3.91592**	0.60830
11	CLNPD	15.83	3.40	-.09	0.63175	3.54537**	0.62361
31	RESST	22.21	3.36	.17	0.14367	3.26456**	0.63822
21	CLNSI	25.21	9.57	-.02	0.08860	2.98149**	0.64836
27	RESDY	18.74	8.45	-.16	-0.12450	2.78177**	0.66022
16	CLNPTK	27.28	5.05	-.04	-0.01619	2.86707**	0.68846
26	RESCA	8.68	5.26	.20	-0.14523	2.75572**	0.70218
10	CLNHY	22.51	4.21	.07	0.10539	2.93232**	0.73212
25	REGLB	9.94	2.67	.19	-0.13250	3.15084**	0.76129
23	RESR	15.72	3.90	-.08	-0.10304	3.05247**	0.77220
9	CLND	19.32	4.89	-.13	0.10392	3.04538**	0.78672
17	CLNSC	9.15	6.16	.06	-0.29814	2.99725**	0.79830
22	RESA	9.43	7.43	-.15	0.12174	3.00534**	0.81536
13	CLNMF	29.23	5.31	-.01	0.04163	3.11563**	0.82871
18	CLNSCK	26.45	5.22	.20	0.17720	2.96789**	0.83391
4	CLNL	3.26	1.94	.01	-0.06897	2.80889**	0.83805
32	RESCN	25.17	4.66	.06	-0.07130	2.73432**	0.84547
6	CLNK	17.17	4.51	.13	-0.30256	2.54712*	0.84740
8	CLNHSK	13.26	3.58	-.05	0.98332	2.35713*	0.84853
7	CLNHS	4.47	3.59	-.15	-1.01576	2.43319*	0.86219
29	RESRE	22.70	2.66	.01	-0.06256	2.28812*	0.86510
28	RESDO	18.15	3.01	.10	0.04402	2.12374*	0.86667
15	CLNPT	10.06	7.07	-.06	0.11175	1.94387	0.86688
5	CLNF	3.00	2.50	-.03	0.00320	1.77276	0.86689
Dependent							
34	PEERAT	6.72	0.92				N = 47

ratings, and the correlation between predicted and achieved scores was found to be $-.1605$.

To see whether the elimination of Ma would make possible an equation that would have predictive validity, a regression equation with only Ma+K, positively weighted, and Pa, negatively weighted, was calculated:

$$Y_{PEBRAT} = .0882 \text{ Ma+K} - .0923 \text{ Pa} + 6.0143$$

This battery accounted for 18 per cent of the variance, 13 per cent by Ma+K and 5 per cent by Pa. The standard error of estimate was $.8413$. When this equation was used to predict the peer ratings of the crossvalidation group, the coefficient of correlation between predicted and achieved scores was $-.2684$, an even greater negative correlation.

Peer ratings for the experimental group had a mean of 6.72 , and a standard deviation of 0.92 . This is quite a small standard deviation for a scale having a mean of over six points, indicating that there was not much discrimination shown in the ratings, which would make prediction more difficult. The mean of the crossvalidation group was 6.6059 , somewhat lower than that of the experimental group, and the mean of the predicted scores was 6.9725 , higher than either. In comparing the profiles of the two groups, in Figure 7, the greatest difference is on Ma+K. The mean of the experimental group was

18.60, and that of the crossvalidation group was 21.06, a difference of 2.46 raw score points. This difference was significant at the .01 level. The two groups were not equivalent so far as scores on this scale were concerned, and when prediction to two decimal places is attempted from raw scores, the difference between the means of 2.46 points is enough to make a difference.

Prediction by the experimental scales. Part of the results of the analysis of variance for regression for the experimental, or auxiliary, scales with peer ratings are presented in Table XVII, while the complete data are found in Table XXIX, in Appendix B. The variable with the highest correlation with the criterion was Un, Underachievement, $-.26$. The Un scale consists of the twenty four items which distinguished extreme underachievers from extreme overachievers in a study at the University of Wisconsin. F value was significant at the .05 level. Added next was Sf, Self sufficiency, positively correlated with the criterion $.18$, increasing the multiple R to $.31468$. The addition of Pr, Prejudice, with a positive correlation of $.12$ with peer ratings, raised the multiple R to $.46140$, with an F value significant at the .05 level. The F value remained significant until the thirteenth

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI EXPERIMENTAL SCALES WITH PEER RATINGS

Source of Variation		D.F.	S.S.	M.S.	F Value		
Due to Regression		34	21.37975	0.62882	0.43480		
Deviation about Regression		12	17.35450	1.44621			
Total		46	38.73425				
Intercept (A Value) is					-5.34741		
No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
34	EXPUN	11.38	1.60	-.26	-0.47271	3.29557*	0.26122
27	EXPSF	23.70	5.82	.18	0.05315	2.41789*	0.31468
22	EXPPR	6.28	3.78	.12	0.51913	3.87682*	0.46140
12	EXPGR	10.34	2.19	.02	-0.31063	3.79801*	0.51546
14	EXPHR	12.79	1.73	.10	0.39795	3.56478*	0.55048
1	EXPAC	15.04	2.18	.03	-0.22736	3.05483*	0.56057
20	EXPNU	10.60	4.60	-.11	-0.17028	2.79342*	0.57788
6	EXPDOR	10.66	2.38	.06	0.40970	2.76811*	0.60679
10	EXPEO	11.55	3.24	-.05	-0.16431	2.57778*	0.62079
4	EXPHSX	12.19	1.86	.05	-0.21053	2.39772*	0.63227
3	EXPAT	13.34	8.06	-.16	-0.20207	2.22892*	0.64183
28	EXPSOR	32.40	4.95	.08	-0.07937	2.20986*	0.66196
13	EXPHC	5.79	3.14	.06	-0.06762	2.05841*	0.66917
9	EXPEM	10.87	5.53	-.06	0.17703	1.95459	0.67894
31	EXPSV	27.98	8.39	-.06	0.10089	1.89868	0.69197
23	EXPPV	15.74	6.53	-.20	0.11212	1.76472	0.69631
33	EXPTP	76.62	12.89	.01	0.08307	1.65219	0.70143
18	EXPMP	12.81	4.20	.10	-0.06029	1.56132	0.70776
2	EXPAE	14.81	2.68	.05	-0.04560	1.45869	0.71171
24	EXPRER	16.53	1.94	-.00	0.20822	1.36610	0.71582
21	EXPOR	12.95	2.87	-.10	-0.04223	1.28064	0.71989
32	EXPTO	24.13	3.40	-.09	0.38602	1.19132	0.72249
7	EXPDY	18.74	8.45	-.16	0.02958	1.10711	0.72486
11	EXPES	50.47	5.38	.15	-0.04592	1.02923	0.72727
19	EXPNO	5.74	3.17	.02	0.01095	0.95614	0.72971
17	EXPPF	36.19	6.39	.05	0.05723	0.89668	0.73366
25	EXPRGM	5.64	1.35	-.05	-0.09391	0.82545	0.73472
29	EXPSP	18.62	3.39	-.03	-0.09328	0.76244	0.73658
16	EXPIM	6.38	3.01	-.06	0.10077	0.70006	0.73774
30	EXPSTR	12.43	1.99	.06	-0.09946	0.64457	0.73974
5	EXPDE	2.15	1.41	-.12	-0.10669	0.59369	0.74227
26	EXPRP	21.13	3.02	.08	0.02766	0.53803	0.74265
15	EXPIE	32.43	3.46	.00	0.01620	0.48531	0.74295
8	EXPEC	11.79	3.77	.02	-0.00011	0.43480	0.74294
Dependent							
36	PEERAT	6.72	0.92				N = 47

variable was added, and the standard error of estimate started increasing after twelve. Knowing that in actual practice the error seems to build up rapidly after the first two or three variables, especially when the correlation with the criterion is slight, only the first three were used for the calculation of the regression equation:

$$Y_{PEERAT} = -.1619 Un + .0724 Sf + .1092 Pr + 6.1572.$$

This battery accounted for 21 per cent of the variance of the criterion: Un, 7 per cent; Sf, 8 per cent; Pr, 5 per cent. The corrected multiple R was .4153, and the standard error of estimate, .8347. This equation was used to predict the peer ratings of the crossvalidation group, and the correlation between predicted and achieved scores was found to be $-.1046$, a slight negative correlation. It was not able to predict peer ratings for this group.

A comparison of the means of the two groups on these three scales shows that they are very similar:

Scale	Experimental	Crossvalidation
Un	11.38	11.75
Sf	23.70	24.16
Pr	6.28	6.34

Therefore there are no significant differences between the means to help explain the lack of predictive validity on crossvalidation. On the other hand, no scale taken alone was significantly correlated with the criterion.

III. FACULTY RATINGS PREDICTED

Agreement among the ratings. Kendall's Coefficient of Concordance W was used to measure the agreement among the faculty ratings, and this relation was tested by Chi-square. For thirty-two degrees of freedom, a value of 46.2 is needed to be significant at the .05 level.¹³ The value found for the faculty ratings of the experimental group was 37.5686, not significant. This could mean that the faculty were not applying essentially the same standards in their ratings, or that they did not know the subjects equally well. The procedure used by Goodling and Webb of having the four faculty members who knew the students best do all the rating¹⁴ might be preferable to having all the faculty take part in the rating, as in this study.

In any case, the fact that there was not significant agreement among the faculty ratings means that the results of the analyses of variance for regression must be taken as

¹³Ostle, loc. cit.

¹⁴R. A. Goodling and S. C. Webb, "An Analysis of Faculty Ratings of Theological Students," Religious Education, 1959, 54, pp. 228-233.

suggestive only. Therefore, no new regression equations were calculated, and no attempt to crossvalidation was made.

Clinical Scales. Complete data of the analysis of variance for regression of the clinical scales with faculty ratings (FACRAT) are found in Table XXXI in Appendix B, but part of the data is reproduced in Table XVIII. The first variable was Ma+K, with a significant (.05 level) correlation with the criterion of .31, and an F value significant at the .05 level. The next variable added was Pa, with a negative correlation of -.25 with faculty ratings, which raised the multiple R to .41880. Next was Pt+K, correlated .11 with the criterion, increasing R to .47599. The addition of Hs (without K correction) increased the Multiple R to .54513, and gave an F value significant at the .01 level. Thirteen of the fourteen variables together had an F value significant at the .05 level, and contributed to a multiple correlation of .73787. However, after ten variables the standard error of estimate increased.

It is worthy of note that the first two variables of the clinical scales chosen for both peer and faculty ratings were Ma+K and Pa. One might conclude that both faculty and fellow students are impressed favorably by a high level of

TABLE XVIII
ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL SCALES WITH FACULTY RATINGS

Source of Variation	D.F.	S.S.	M.S.	F Value
Due to Regression	18	19.55378	1.08632	1.86220
Deviation about Regression	28			
Total	46			

Intercept (A Value) is 4.26512

No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
20	CLNMAK	18.60	3.82	.31	-1.16347	4.70182*	0.30757
14	CLNPA	10.17	2.49	-.25	-0.18925	4.67932*	0.41880
16	CLNPTK	27.28	5.05	.11	-0.28797	4.19884*	0.47599
7	CLNHS	4.47	3.59	-.20	-0.59257	4.43946**	0.54513
13	CLNMF	29.28	5.21	.07	0.02936	3.71517**	0.55839
21	CLNSI	25.21	9.57	-.09	-0.04733	3.52281**	0.58799
19	CLNMA	15.13	3.92	.30	1.19447	3.74628**	0.63408
10	CLNHY	22.51	4.21	-.04	0.08187	3.57576**	0.65535
8	CLNHSK	13.26	3.58	-.20	0.54800	3.34252**	0.66966
9	CLND	19.32	4.89	.04	0.04434	3.15817**	0.68360
15	CLNPT	10.06	7.07	.08	0.39104	2.88339*	0.68949
18	CLNSCK	26.45	5.22	.14	0.11071	2.67133*	0.69662
11	CLNPD	15.83	3.40	.01	-0.87612	2.47620*	0.70270
12	CLNPKD	22.74	3.69	.03	0.86828	2.67097*	0.73407
5	CLNF	3.00	2.50	.04	-0.01992	2.43832*	0.73570
17	CLNSC	9.15	6.16	.11	-0.07079	2.22420*	0.73661
6	CLNK	17.17	4.51	.01	-0.17115	2.03875*	0.73787
4	CLNL	3.26	1.94	-.14	-0.01377	1.86220	0.73815

Dependent

33	FACRAT	6.35	0.88				N = 47
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energy and ambition, and unfavorably by suspiciousness and hypersensitivity.

Research scales. The only research scale significantly correlated with faculty ratings was Cn, Control, .32, and thus was the first variable used in the regression equation, as seen in Table XIX (complete data in Table XXXII in Appendix B). The second variable included was Do, Dominance, which had a simple correlation of .24 with the criterion, and increased the multiple R to .38467, with an F value significant at the .05 level. Prejudice, when added, increased the multiple R to .41296, and had a significant F value, but with the addition of other variables, the value of F was insignificant. Only the three, then showed any promise of predictive validity.

The most highly correlated scale, Cn, is a hard scale to interpret in normal populations. It was designed to distinguish psychiatric patients who would require hospitalization from those equally disturbed who might be able to maintain themselves outside a hospital--or outside the locked ward of the hospital. One of the factors involved that seems fairly well confirmed in validation studies seems to be that of realistic self-appraisal. "Inspection of the items suggests that a person answering in the indicated direction

TABLE XIX

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI RESEARCH SCALES WITH FACULTY RATINGS

Source of Variation	D.F.	S.S.	M.S.	F Value
Due to Regression	11	10.66258	0.96932	1.34495
Deviation about Regression	35	25.22511	0.72072	
Total	46	35.88770		

Intercept (A Value) is -1.03878

No.	Name	Mean	SD	Simple r	Reg. Coef.	F Value	Multiple R
32	RESOQ	25.17	4.66	.32	-0.02142	5.19257*	0.32164
28	RESDO	18.15	3.00	.24	0.15945	3.82082*	0.38467
30	RESPR	6.28	3.68	.06	0.07221	2.94690*	0.41296
34	RESHS	49.89	5.31	.19	0.06627	2.54928	0.44199
22	RESA	9.43	7.43	.08	0.09307	2.60252	0.49083
25	RESLB	9.94	2.67	.08	0.06176	2.33899	0.51363
26	RESCA	8.68	5.26	-.02	-0.05690	2.18173	0.53047
23	RESR	15.72	3.90	.22	-0.02514	1.93282	0.53779
27	RESDY	16.74	8.45	.04	0.01559	1.71867	0.54298
29	RESRE	22.70	2.66	-.04	0.02431	1.51788	0.54459
31	RESST	22.21	3.36	.18	-0.00770	1.34495	0.54508

Dependent

33	FACRAC	6.35	0.88				N = 47
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might be described by acquaintances as rather sophisticated, realistic, somewhat impatient with naive, overly moralistic, and opinionated persons but withal quite aware of his own weaknesses and inwardly sensitive to social criticism."¹⁵

However, many of the items included are scored in the opposite direction from the normal population, and a high score on the Control scale accompanies elevations on the clinical scales. Several items have to do with religious beliefs. Dahlstrom and Welsh feel, "There is a need for a good deal more information about the Cn scale before it can be interpreted as an index of personality control."¹⁶ It can be noted from Figure 5, page 94, that there is considerable variation from group to group of CTS students on this scale.

Clinical and research scales. When both sets of scales are combined, the order of the variables is Cn, Hs (without K correction), Sc+K, and Pa, as seen in Table XX. Ma+K is far

¹⁵C. A. Cuadra, "A Scale for Control in Psychological Adjustment (Cn)" Basic Readings on the MMPI in Psychology and Medicine, G.S.Welsh and W.G.Dahlstrom, eds. (Minneapolis, Univ. of Minnesota Press, 1956), p. 249.

¹⁶W. G. Dahlstrom and G. S. Welsh, An MMPI Handbook. (Minneapolis, University of Minnesota Press, 1960), p. 301.

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI CLINICAL AND RESEARCH SCALES WITH FACULTY RATINGS

Source of Variation		D.F.	S.S.	M.S.	F Value		
Due to Regression		29	24.60116	0.84832	1.27775		
Deviation about Regression		17	11.28653				
Total		46	35.88770				
Intercept (A Value) is -1.71622							
No.	Name	Mean	SD	Simple Reg. r	F Coef. Value	Multiple R	
32	RESCN	25.17	4.66	.32	0.00185	5.19257*	0.32164
7	CLNHS	4.47	3.59	-.20	-0.75510	5.07358*	0.43290
18	CLNSCK	26.45	5.22	.14	0.23358	4.51868**	0.48958
14	CLNPA	10.17	2.49	-.25	-0.09457	4.48774**	0.54720
10	CLNHY	22.51	4.21	-.04	-0.02573	4.27317**	0.58531
16	CLNPTK	27.28	5.05	.11	-1.02948	4.05562**	0.61501
23	RESR	15.72	3.90	.22	-0.06028	3.99079**	0.64603
28	RESDO	18.15	3.01	.24	0.17490	3.71532**	0.66249
22	RESA	9.43	7.43	.05	0.13758	3.95249**	0.70012
4	CLNL	3.26	1.94	-.14	0.04529	3.72983**	0.71334
29	RESRE	22.70	2.66	-.04	0.04952	3.42557**	0.72003
30	RESPR	6.28	3.68	.06	0.20432	3.27184**	0.73206
21	CLNSI	25.21	9.57	-.09	-0.01004	3.08558**	0.74070
13	CLNMF	29.28	5.21	.07	0.06793	2.96049**	0.75121
9	CLND	19.32	4.89	.04	0.01785	2.82409**	0.75989
11	CLNPD	15.83	3.40	.01	-1.46834	2.61782*	0.76333
12	CLNPK	22.74	3.69	.03	1.47961	2.45894*	0.76838
15	CLNPT	10.06	7.07	.08	1.05701	2.37987*	0.77764
31	RESST	22.21	3.36	.18	-0.08696	2.34433*	0.78905
17	CLNSC	9.15	6.16	.11	-0.31453	2.29550*	0.79902
19	CLNMA	15.13	3.92	.30	0.58542	2.24686*	0.80849
8	CLNHSK	13.26	3.58	-.20	0.56127	2.14136*	0.81394
25	RESLB	9.94	2.67	.08	0.08936	2.04793*	0.81970
20	CLNMAK	18.60	3.82	.31	-0.53545	1.94960	0.82474
26	RESCA	8.68	5.26	-.02	0.02988	1.81159	0.82656
6	CLNK	17.17	4.51	.01	0.21263	1.66838	0.82730
24	RESES	49.89	5.31	.19	-0.01138	1.53074	0.82769
27	RESDY	18.74	3.45	.04	-0.00660	1.40092	0.82792
5	CLNF	3.00	2.50	.04	0.00470	1.27775	0.82795
Dependent							
33	FACRAT	6.35	0.88				N = 47

down, in twenty-fourth position to be added, because of inter-correlations between it and scales added previously, though its correlation with the criterion is .31, as compared to .32 for Cn. The F value is significant at the .05 level for the first two variables, then becomes so at the .01 level with the addition of the third. F value remains significant through the addition of twenty-three variables, with a multiple R of .81970. Complete data are found in Table XXXII, in Appendix B.

Experimental scales. No one of the experimental, or auxiliary scales had a significant correlation with faculty ratings, but the highest of -.20 for Sv, Sexual Deviation, made it the first variable chosen for the regression equation, shown in the analysis of variance for regression of the experimental scales with faculty ratings in Table XXI. When Tp, Teaching Potential, was added, the multiple R more than doubled to .46230, and the F value became significant at the .01 level. The third variable included was No, Neurotic overcontrol, increasing the multiple R to .50959, and with a F value significant at the .01 level. All three of these variables are negatively correlated with faculty ratings. This is not surprising for Sv, which has been found to be more a measure of general personality disintegration than specifically sexual

TABLE XXI

ANALYSIS OF VARIANCE FOR REGRESSION
MMPI EXPERIMENTAL SCALES WITH FACULTY RATINGS

Source of Variation		D.F.	S.S.	M.S.	F Value		
Due to Regression		34	31.10613	0.91489	2.29603		
Deviation about Regression		12	4.78157	0.39846			
Total		46	35.88770				
Intercept (A Value) is -23.97927							
No.	Name	Mean	SD	Simple Reg. r	Reg. Coef.	F Value	Multiple R
31	EXPSV	27.98	8.39	-.20	-0.02795	1.91301	0.20194
33	EXPTP	76.62	12.89	-.08	-0.00999	5.98001**	0.46230
19	EXPNO	5.74	3.17	-.10	-0.01061	5.02785**	0.50959
22	EXPPR	6.28	3.68	.06	1.15097	4.52666**	0.54886
16	EXPIM	6.38	3.01	.07	-0.15137	4.74276**	0.60534
11	EXPES	50.47	5.38	.17	-0.15417	4.38352**	0.62979
27	EXPSF	23.70	5.82	-.08	0.07454	4.03810**	0.64824
23	EXPPV	15.74	6.53	-.08	0.06343	4.16388**	0.68346
14	EXPHR	12.79	1.73	.04	-0.16902	4.27361**	0.71393
18	EXPMP	12.81	4.20	-.00	-0.10324	3.94182**	0.72295
20	EXPNU	10.60	4.69	.17	0.15690	3.57893**	0.72758
7	EXPDY	18.74	8.45	.04	0.09948	3.33982**	0.73554
24	EXPRER	16.53	1.94	.03	0.54703	3.17361**	0.74538
28	EXPSOR	32.40	4.95	.02	0.05578	3.02772**	0.75487
25	EXPRGM	5.64	1.36	-.04	-0.38233	3.04098**	0.77161
10	EXPEO	11.55	3.24	-.18	-0.15506	2.99456**	0.78419
17	EXPLP	36.19	6.39	.07	0.05006	2.89214**	0.79309
3	EXPAT	13.34	8.06	-.02	-0.23826	2.81420**	0.80221
32	EXPTO	24.13	3.40	-.00	1.23036	2.90101**	0.81927
4	EXPHSX	12.19	1.86	-.18	-0.19650	2.90876**	0.83134
2	EXPAE	14.81	2.69	-.16	-0.06564	2.98421**	0.84548
12	EXPGR	10.34	2.19	-.10	-0.32696	3.13040**	0.86115
6	EXPDOR	10.66	2.33	.14	0.32323	3.40114**	0.87908
26	EXPRP	21.13	3.02	.02	-0.04299	3.39276**	0.88729
15	EXPIE	32.43	3.46	.04	-0.02655	3.31161**	0.89312
1	EXPAC	15.04	2.18	.03	0.17919	3.29125**	0.90031
34	EXPUN	11.38	1.60	-.13	0.04579	3.26262**	0.90696
9	EXPEM	10.87	5.53	.03	0.09154	3.12017**	0.91058
29	EXPSP	18.62	3.39	.10	-0.13591	3.03665*	0.91553
21	EXPOR	12.96	2.87	-.14	-0.12654	3.03482*	0.92224
13	EXPHC	5.79	3.14	-.05	0.06104	2.91701	0.92613
5	EXPDE	2.15	1.41	-.14	-0.16641	2.75057	0.92885
8	EXPEC	11.89	3.77	.10	0.05528	2.55970	0.93093
30	EXPSTR	12.43	1.99	.19	-0.01510	2.29603	0.93100
Dependent							
35	FACRAT	6.25	0.88				N = 47

deviation,¹⁷ or for No, which shows "susceptibility of the personality structure to stress and anxiety in which the anxiety is handled primarily by obsessive, constrictive, and withdrawing techniques."¹⁸

Inspection of the table is interesting, but the information therein can only be taken as suggestive, in view of the low coefficient of concordance found between the faculty ratings.

¹⁷Ibid., p. 317.

¹⁸Ibid., p. 303.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study had two general purposes. One was to establish norms for the Minnesota Multiphasic Personality Inventory for students at Christian Theological Seminary that could be compared with general population norms and with the norms of two other studies of Protestant seminarians. It was assumed that this would help answer the questions of (a) how seminarians differ from men in general, and (b) whether special and/or local CTS norms are needed for the interpretation of individual profiles of seminary students. The other purpose was to see whether any one or any combination of the scales of the MMPI could predict ministerial effectiveness as measured by (a) grade point average after two semesters of seminary work, (b) peer ratings, and (c) faculty ratings.

Summary. Norms for CTS were established upon an N of seventy-six, using the scores of the entering classes of 1963 and 1964. The CTS mean scores on the clinical scales were higher than the general norms on all scales except Si.

The scores on Hy, Pd, Pa, Pt, Sc, and Ma were more than half a standard deviation above the mean, while the peak score on Mf was one and a half standard deviations above, for a T score of sixty-five.

Conclusion. The general tendency of college and college-educated groups to score higher than the general population mean was found also with this group. Special seminary norms need to be taken into consideration in the interpretation of the MMPI profiles of students at CTS.

Summary. Comparison of the CTS profile on the clinical scales with the profiles of United Presbyterian and Southern California School of Theology seminarians indicated that they were very similar indeed, more similar to each other than to Catholic seminarians or to college populations. The mean scores on Mf, Pa, L, and Sc were almost identical. The greatest difference found was on D, 1.93 raw score points, less than half a standard deviation according to the general norms. The differences on the eight other scales were smaller, less than the difference found in comparative studies of college populations.

Conclusion. These three Protestant seminary profiles

are so similar that local norms for each seminary would seem unnecessary.

Summary. The profiles of upperclassmen and graduate students compared with entering students showed a tendency for lower scores on L, F, and Ma, very little change on Mf, and higher scores on all the other nine scales. Test-retest findings on students at Southern California School of Theology indicated very similar tendencies.

Conclusion. This seems to indicate that personality changes may be taking place during the seminary experience.

Summary. Norms were also established for the eleven research scales. CTS mean scores differed from general norms by more than half a standard deviation on Es, Do, Re, Pr, St, and Cn. United Presbyterian norms on these scales were not available, except on three also included in the experimental scales.

CTS norms found for the thirty-four experimental (auxiliary) scales were compared with the United Presbyterian Seminary Male Norms for the Auxiliary Scales of the MMPI.¹

¹Clifford E. Davis, Guide for Counseling Prospective Church Workers, Supplement II (Pittsburgh, Board of Christian Education, United Presbyterian Church, 1963), p. 22.

The differences between the means of eighteen of the scales were less than one raw score point, and the differences on only seven exceeded two score points.

Conclusion. The same divergence from general population norms and similarity to other seminarians found for the clinical scales were found for these scales, and further indicate the need for special seminary, but not local, norms.

Summary. Criteria for the predictive validity aspect of the study included grade point average for two semesters of seminary work; peer rating, obtained by averaging the scores of three ratings of each student by peers on the Ministerial Effectiveness Rating Scale; faculty rating, the average of three ratings by faculty members using the MERS. These three criteria were used as the dependent variables, and the clinical, research, and experimental scales of the MMPI were used as the independent variables for multiple regression and correlation analyses.

A matrix of intercorrelations of the clinical and research scales with the dependent variables and a matrix of the experimental scales with the dependent variables were calculated. Grade point average was found to have a

coefficient of correlation with Mf of .36, significant at the .02 level; with Or of .29, significant at the .05 level; with Sc+K of .28, and with Re-r of .28.² Peer ratings had a correlation of .34 with Ma+K, significant at the .02 level; of .28 with Ma (without K correction). The highest correlations with faculty ratings were Cn (.32), significant at the .05 level; Ma+K (.31), significant at the .05 level, and Ma (without K correction) (.28). Grade point average was found to be significantly correlated with faculty ratings (.36) at the .02 level, and correlated .28 with peer ratings. Faculty and peer ratings were significantly correlated (.34) at the .02 level.

The analyses of variance for regression used all the variables in each set of scales, but three further restrictions were used to choose variables for a simpler regression equation, because the whole set of variables did not have a significant F value. These variables were used first in a Wherry-Doolittle test selection procedure, then the regression equation calculated using beta weights and transformed into score form. In each case the new equation was used to predict the criterion scores of the crossvalidation group,

².05 = .288; .02 = .340; .01 = .372.

the correlation coefficient between the predicted and the achieved scores calculated, and tested for significance. A summary of these equations, the multiple correlation with the criterion found for the experimental group, and the correlation between the predicted and achieved scores of the cross-validation group is given in Table XXII, on the following page. Because data was available on the California Test of Mental Maturity, Form S, Adult, 1957, two of the equations include it, to see whether the combination of the CTMM and the MMPI could predict better than either alone.

The evidence in Table XXII indicates that (1) the equation using the CTMM Language Factor alone predicted grade point average significantly at the .02 level; (2) the equation using the *Mf*, *Es*, and *Sc+K* scales of the MMPI predicted it significantly at the .02 level; (3) the equation using the *Or*, *Rp* and *Es* scales of the MMPI predicted grade point average at the .02 level; and (4) the combination of the CTMM Language Factor and the MMPI *Mf* scale predicted it significantly at the .02 level.

Conclusion. The best predictor of grade point average was, not surprisingly, the California Test of Mental

TABLE XXII

A SUMMARY OF REGRESSION EQUATIONS, MULTIPLE R WITH
EXPERIMENTAL GROUP, AND CORRELATION OF PREDICTED
AND ACHIEVED SCORES OF CROSSVALIDATION GROUP

Regression Equations	R, Exp.	r, CV.
1. $Y_{GPA} = .035 Mf + .042 Es + .040 Sc + K$ $-.062 Lb - .7132$	.6093**	.3034
2. $Y_{GPA} = .038 Mf + .0384 Es +$ $.0262 Sc + K - .867$	.5235**	.4210'
3. $Y_{GPA} = .0119 CTMM LF + .031 Mf$ $-.0234 D + .9437$	.5581**	.3168
4. $Y_{GPA} = .0132 CTMM LF + .0226 Mf$ $+ .5791$	.5234**	.4124'
5. $Y_{GPA} = .0153 CTMM LF + .9850$	.48 **	.4452'
6. $Y_{GPA} = .056 Or - .079 Rp +$ $.030 Es + 2.276$	.4914**	.4186'
7. $Y_{PEERAT} = .2718 Ma + K - .0884 Pa$ $-.1850 Ma + 5.3866$	.4224**	-.1605
8. $Y_{PEERAT} = .0882 Ma + K - .0923 Pa$ $+ 6.0143$	.4214**	-.2684
9. $Y_{PEERAT} = -.1619 Un + .0724 Sf$ $+ .1092 Pr + 6.1572$	.4153**	-.1046
*Significant at the .05 level: $\geq .288$		$\geq .349$
'Significant at the .02 level: $\geq .340$		$\geq .412$
**Significant at the .01 level: $\geq .372$		$\geq .449$

Maturity, Language Factor, used alone, since it was designed to predict academic success. However, personality variables as measured by some of the scales of the MMPI were also found to predict at the same level of significance. Correlations between the CTMM Language Factor and scales of the MMPI were not significant, indicating that they were measuring different things. Therefore, further study of combinations of intellectual and personality variables as measured by the MMPI seem promising.

Summary. The degree of agreement between the peer ratings as tested by Kendall's Coefficient of Concordance W was significant at the .01 level for the experimental group, and at the .001 level for the crossvalidation group. Equations using the Ma+K, Pa (negatively weighted) and Ma scales of the clinical scales, and using the Un (negatively weighted), Sf, and Pr of the experimental scales, had a multiple correlation with peer ratings of the experimental group significant at the .01 level, as shown in Table XXII. When these equations were used to predict the peer ratings of the cross-validation group, the correlation between predicted and achieved scores was not significant at the .05 level--it was a negative correlation.

Conclusion. Though having significant correlation with the criterion for the experimental group, no equation found using MMPI variables was able to significantly predict peer ratings for the crossvalidation group.

Summary. When the faculty ratings were tested for degree of agreement by Kendall's Coefficient of Concordance, the agreement found was not significant at the .05 level accepted as minimum for this study. Therefore no regression equations using fewer variables were calculated.

General conclusions. The hypothesis that the same type of profile pattern found in United Presbyterian and Southern California School of Theology normative studies of Protestant seminary students would be found in norms developed for students at Christian Theological Seminary can be accepted. The three profile patterns were found to be quite similar, almost identical at several points, making local norms for each seminary unnecessary. However, all three differ sufficiently from general norms that special norms for seminary students need to be taken into consideration in the interpretation of MMPI profiles of seminarians.

The hypothesis that regression equations could be calculated that could predict grade point average using the

scores on some of the clinical, research, or experimental scales of the MMPI can be accepted. That regression equations could be calculated which could predict peer ratings, using scores on the appropriate scales of the MMPI, must be rejected. Faculty ratings did not show significant agreement among the raters, so the hypothesis that they could be predicted must be rejected.

Recommendations for further research. There were questions raised and difficulties encountered in this study that indicate a need for further research. Some recommendations are:

1. That data from several Protestant seminaries be pooled to establish "Protestant Seminary Norms for the Minnesota Multiphasic Personality Inventory."

2. That item analyses of the Mf, Hy, Pa, Ma, and Pd scales be made, to see just what factors are contributing to the elevation characteristically found in the profiles of seminary students on these scales.

3. That further study of the question of criteria of ministerial effectiveness is needed, since the first requirement of prediction is adequate criteria.

4. That further studies be made of ratings, especially

of faculty ratings, to determine how validity and reliability might be improved.

5. That studies be made of drop-outs, and their MMPI profiles that might be characteristic or predictive.

6. That longitudinal studies be made as students progress through the seminary and into the pastorate.

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APPENDIX A

DESCRIPTION OF THE AUXILIARY SCALES OF THE MMPI*

2 Ac - Academic Achievement

This is an attempt to develop a brief personality scale to predict college undergraduate course grades. The author hoped its findings would contribute to a broader understanding of some of the nonintellective factors relating to academic achievement, particularly those factors having to do with personal values, beliefs, and self-definitions.

This scale was standardized on introductory psychology classes at the University of California, University of Minnesota and Vanderbilt University.

Harrison G. Gough, Journal of Applied Psychology, 1953, 37, 361-366.

4 Ae - College Achievement

This scale is an attempt to find some significant relationships between the way college students respond to adjustment items and the type of grade averages which they earn, intelligence being held constant. The method of equated groups was used, the basis of the equating being the standard scores earned on the "Altus Measure of Verbal Aptitude."

Two classes in elementary psychology at the Santa Barbara College, University of California (1947) were used.

W. D. Altus, Journal of Applied Psychology, 1948, 32, 385-397.

16 At - Iowa Manifest Anxiety

The use of the anxiety scale in this connection was based on two assumptions: (1) that variation in drive level of the individual is related to the level of internal anxiety

*C. E. Davis, Guide for Counseling Church Workers. (Pittsburgh, Board of Christian Education, United Presbyterian Church, 1963) Supplement II, pp. 8-15.

emotionality; (2) that the intensity of this anxiety could be ascertained by a paper and pencil test consisting of items describing overt or manifest symptoms of this state. This test consists of 50 items* from the MMPI.

* These 50 items represent the At scale on the MMPI.

This test was given to 1971 students at the State University of Iowa from 1948 to 1951; also to 683 airmen at the beginning of basic training at Lackland Air Force Base; and to 201 Northwestern University night school students.

Janet A. Taylor, Journal of Abnormal Social Psychology, 1953, 48, 285-290.

HSX - Homosexuality

The HSX scale shows considerable promise in distinguishing male homosexuals from nonhomosexuals in a prison population. The norms for this scale were made from the responses of inmates in the North Carolina prison system. From this sample, a raw score of 12 or higher indicates 81 percent of the homosexuals, but only 13 percent of the "normal" prison population.

The scale itself is not a good indicator of homosexuality among theological students, but is useful in connection with two other scales: sexual deviation (SV) and masculinity-femininity (Mf). The following high score pattern indicated 35 percent of the homosexuals and includes only 6 percent of the normals. These figures are based on a small sample of 17, but suggest a pattern for further study.

High Score Pattern

Mf	70 and above
SV	31 and above
HSX	12 and above

James H. Panton, "A New MMPI Scale for the identification of Homosexuality," Journal of Clinical Psychology, Vol.XVI.17.

47 De - Delinquency

All items on this scale are found on the So scale of the

California Psychological Inventory. The So scale (Socialization) indicates the degree of social maturity and integrity which the individual has attained. Scores to the right suggest a serious, honest industrious person who is conscientious, responsible, and conforming. Scores to the left suggest a defensive, demanding, opinionated individual who may be deceitful in dealing with others.

Harrison G. Gough, California Psychological Inventory Manual, 1957.

50 Do-r - Dominance

All items on this scale are found on the Do scale of the California Psychological Inventory. This scale attempts to assess factors of leadership, dominance, persistence, and social initiative. Scores to the right are aggressive, confident, persistent, persuasive, and verbally fluent. Scores to the left tend to be retiring, inhibited, indifferent, and unassuming.

Harrison G. Gough, California Psychological Inventory Manual, 1957.

57 Dy - Dependency

This paper reports the development and initial use of an MMPI scale to measure dependence. Sixteen judges independently specified the MMPI items that they felt would bear on dependence.

Fifty-seven items survived and constitute the scale. Reliability is .91.

Leslie Navran, Journal of Consulting Psychology, 1954, 18, 192.

58 Ec - Escapism

Propensity for escape among imprisoned felons derives at least in part from constellations of personality variables, which if identified could serve to differentiate between potential escapist and nonescapist.

The 42 variables used in the index appear to be derived independently of any single scale or groups of scales of the MMPI.

Norms were established on 413 male felons (1955) with intelligence above 80; and 103 escapees - experimental group and 100 nonescapees - control group.

H. S. Beall and J. H. Panton, Journal of Clinical Psychology, 1956, 13, 392-394.

59 Em - Emotional Immaturity

This investigation has developed as an effort to improve the professional understanding and application of the term "emotional immaturity" through analysis of responses to the MMPI of various groups of adult subjects.

This trait has been described as a "feeling tone." The immaturity may be overt, but it does not have to be. The individual may express his immature emotionality via temper tantrums, pouting, etc. Even if he successfully inhibits such expressions he is still emotionally immature if he feels like doing so.

Major findings stem from the analysis of responses to MMPI items of several groups of psychiatric patients in relation to the responses of various normal groups.

The assumption that individuals mature in their emotional adjustments as they grow older did not hold up in this investigation. Rather, it appeared that the older adults responded slightly more frequently in the manner characteristic of emotionally immature psychiatric patients.

John Simner Pearson, Ph.D. dissertation, University of Minnesota, 1954.

60 Eo - Ego Overcontrol

Unpublished material.

J. Block, mimeographed materials, Berkeley, Institute

of Personality Assessment and Research, University of California, 1953.

62 Es - Ego Strength

This paper reports the development and cross-validation of a scale which was originally designed to predict the response of psychoneurotic patients to psychotherapy. However, a somewhat broader psychological interpretation could be placed upon it, making it useful as an assessment device in any situation where some estimate of adaptability and personal resourcefulness is wanted. It appears to measure the various aspects of effective personal functioning which are usually subsumed under the term "ego strenght."

Frank Barron, Journal of Consulting Psychology, 1953, 17, 327-333.

71 Gr - Graduate School Potential

Gough (1953b) has also found evidence that achievement in college programs and in graduate school may be more closely correlated with independence and originality than with the conformity that is typically rewarded at the high school level.

74 HC - Hostility Control

One of the most difficult stages of therapy for the therapist to handle adequately is the "negative transference" phase. The patient's neurosis is threatened with the loss of infantile gratifications which it previously gained from the symptoms. To counteract this process, the patient reacts with defensive behavior which is unconsciously formulated to break up the therapy relationship. Any information the psychologist has about how the patient is liable to manifest his defensive hostility is of great value in helping him work through this phase of therapy with the patient.

Two groups of patients were used. The first group was 119 patients from the Veterans Administration Mental Hygiene Clinic at Oakland, California. The second group was 52 patients from the Psychological Clinic at Pennsylvania State University.

Starling Donald Schultz, Ph.D. dissertation, Pennsylvania State University, 1954.

78 Hr - Honor Point Ratio

It is not at all certain that this is actually a measure of intellect. Nevertheless, it does correlate significantly with conventional tests of intelligence. The two immediate aims of this project were to determine whether a criterion-specific set of personality inventory items could be assembled which would correlate significantly with accepted measures of intellect, and to determine whether individual items could be combined in a scale which would have anything approaching practical significance and value.

Items on this scale are identical with items on the Ai scale of the California Psychological Inventory. The Ai scale (Achievement via independence) was designed to identify those factors of interest and motivation which facilitate achievement in any setting where autonomy and independence are positive behaviors.

Harrison G. Gough, Journal of Consulting Psychology, 1953, 17, 242-246.

California Psychological Inventory
Manual, 1957.

92 Ie - Intellectual Efficiency

All items on this scale are identical to items found on the Ie scale of the California Psychological Inventory. The Ie scale (Intellectual efficiency) was designed to indicate the degree of personal and intellectual efficiency which the individual has attained. Scores to the right suggest a clear-thinking, planful, thorough, alert, and well-informed individual. Those on the left suggest a cautious, confused, defensive, shallow, and unambitious person.

Harrison G. Gough, California Psychological Inventory
Manual, 1957.

93 Im - Impulsivity

This scale is a reversal of the Sc scale on the Califor-

nia Psychological Inventory. The Sc scale (Self-control) was designed to assess the degree and adequacy of self-regulation and self-control and freedom from impulsivity and self-centeredness. Scores to the left suggest an impulsive, excitable, irritable, inhibited individual. Those to the right suggest a calm, patient, slow, self-denying person who is strict and thorough in his own work and in his expectations for others. Such a person is described as being honest and conscientious.

Harrison G. Gough, California Psychological Inventory Manual, 1957.

106 Lp - Leadership

The only information available is in the listing in An MMPI Handbook, W. Grant Dahlstrom and George Schlager Welsh.

124 Mp - Positive Malingering

Falsification of response has long been known to be an important factor which limits the validity of the personality inventory or questionnaire. The present study was designed to investigate malingering on the MMPI by investigating the behavior of F and K malingering; attempting to discover "malingering susceptible" and "malingering proof" items; and studying the relationship of these latter items to Wiener's subtle and obvious items.

Three groups of college sophomores were used: positive malingerers, negative malingerers, and controls. This group was composed of 81 males and females.

C. N. Cofer, June E. Change, and A. J. Judson, Journal of Psychology, 1949, 27, 491-499.

131 No - Neurotic overcontrol

134 Nu - Neurotic undercontrol

High No scores (to the left) are described as reluctant to enter into new experiences, are self-conscious in social situations, and are overly responsive to other people's

valuations rather than their own.

High Nu scores (left) present physical signs of tenseness, restlessness, embarrassment. They are unable to control impulses manifested in acting out, externalizing, and even anti-social behavior.

The reference briefly describes the work of Block on these two scales. The correlation between them is not significant.

Nakamura, C. Y., "Measures of Over-controlled and Under-controlled Behavior: a Validation," Journal of Clinical Psychology, 1960, 16, 149-153.

135 Or - Originality

The only information available is in the listing in An MMPI Handbook, W. Grant Dahlstrom and George Schlager Welsh, and on pp. 251-252 in that book.

162 Pr - Prejudice

Previous work with the MMPI has revealed that quite useful scales for the prediction of socio-economic status and academic achievement could be developed, and this fact suggested that a similar analysis with respect to ethnic attitudes might yield a number of items that would bear no apparent relationship to the continuum being studied, but which would nevertheless constitute reliable predictors of it. Furthermore it was found in the previous studies that inspection of the items themselves added appreciably to an understanding of the psychological dimensions considered, in addition to any usefulness attaching to the scales as such. It was decided to carry out an item analysis of the MMPI to determine whether an "anti-Semitism" scale might be developed.

The first step was to administer the Levinson-Sanford anti-Semitism scale to a class of 271 high school seniors in a Midwestern community. From this scale the 40 highest scoring students (22 boys, 18 girls) and the 40 lowest scoring students (22 boys, 18 girls) were chosen for special consideration. The responses of these two subsamples to the MMPI

were next tabulated and each item discriminating at or beyond the .05 level were retained. 47 items appeared in this analysis. These 47 items were given to a new senior class of 263 students, who had also taken the Levison-Sanford anti-semitism scale. The 32 items retained were considered as a scale, which appeared to be sufficiently reliable and valid to be used as a measuring instrument in its own right.

Harrison G. Gough, Journal of Social Psychology, 1951, 33, 247-255.

167 Pv - Pharisaic Virtue

An attempt to develop scales for the MMPI which measure a person's ability to get along well with others was the aim of this study. This type of scale should prove valuable in selecting personnel who must deal with the public or work harmoniously and effectively with a group. This scale may prove useful in the selection of salespeople, officers and noncommissioned officers in the Armed Forces, foremen, and other personnel who must be able to establish rapport with others and maintain group morale.

When the Minnesota Teachers Attitude Inventory was standardized on a large sample of Minnesota teachers, it was possible to identify in the extremes of distribution two groups of teachers sharply differing in their ability to get along with pupils. The MMPI was administered to these two groups and 212 completed the test--112, representing approximately 8 percent of the teachers scoring highest, and 100, the 8 percent scoring lowest (among all the public-school teachers in Minnesota) on the MTAI. The Pv scale, along with the Hostility scale, was taken from 250 discriminating items on the MMPI. The reference cited suggests that a person with a high Pv score is preoccupied with morality and ridden with fears and tensions.

W. W. Cook and D. M. Medley, Journal of Applied Psychology, 1954, 38, 414-418.

174 Re-r - Social Responsibility, Revised

This paper is a second report on the development of

scales and measuring instruments designed to be utilized in a large-scale study of political participation. As in the case of the Dominance scale, the study was begun with an externally defined social criterion. The aim of the present study is not the construction of a factorially pure measuring instrument, but the development of a scale which will order individuals according to their social responsibility. The peer group nomination technique was used in developing this scale. Subjects were asked to choose the "most" and "least" responsible members in their particular group, and were urged to ignore such considerations as friendliness, popularity, etc. A scale-questionnaire plus some MMPI items was then used.

The responsible person is one who shows a ready willingness to accept the consequences of his own behavior, dependability, trustworthiness, and a sense of obligation to the group. For screening college students the scale would properly classify 78 percent of the cases.

H. G. Gough, H. McClosky, and P. E. Meehl, Journal of Abnormal Social Psychology, 1952, 47, 73-80.

175 Rg.f - Rigidity-Female

176 Rg-m - Rigidity-Male

The purpose of the present study was to test two hypotheses about the unidimensionality of emotional responsiveness and rigidity.

Two scales were presented: (1) a personality scale of emotional responsiveness (E scale) and (2) a personality scale of rigidity (R scale).

Three hundred ten subjects were used: 155 males and 155 females. The females consisted of 134 students in the General Arts Courses at the University of Toronto and 21 clinical patients from a psychiatric hospital and a female reformatory. The males consisted of 121 students in the General Arts Courses at the University of Toronto and 34 patients from a psychiatric hospital and clinic for drug addicts and alcoholics.

V. Cervin, Journal of Personality, 1957, 25, 626-642.

177 Rp - Role-playing

The term "role-taking ability" refers to the facility with which a person can perceive and act out organized behaviors or roles (i.e., putting himself in someone else's position).

It may well be a combination of some more basic factors: (1) It is largely a product of social inter-action. (2) It is a quantitative variable. (3) The concept appears to be a useful one despite the unclear nature of role-playing ability as a "trait."

William A. McClelland, Journal of Consulting Psychology, 1951, 15, 102-108.

189 Sf - Self-sufficiency

The aim of this investigation was to study the "generality of certainty" and its relation to manifest anxiety. The assumption was that a person reporting more instances of self-sufficiency was indicating more subjective certainty.

Sixty Stanford women enrolled in Introductory Psychology were tested.

W. M. Wolff, Journal of Abnormal Social Psychology, 1955, 50, 59-64.

195 So-r - Social Desirability, Revised

The original work on this scale was done by Allen L. Edwards and is discussed in the manual to his test: Edwards Personal Preference Schedule Manual. It represents an extensive effort to decide how much social desirability has affected the person's answers to the questions. The correlation between this scale and the K scale has been found to be .63

Edwards suggests that high scores (right) are those who tend to get suggestions from others, to follow instructions, and to do what is expected of them. They accept the leadership of others, avoid the unconventional, and tend to let

others make decisions.

Allen L. Edwards, Edwards Personal Preference Schedule Manual, 1954. The Psychological Corporation, New York.

196 Sp - Social Participation

This particular factor frequently turns out to be the key element in a counseling problem.

Four high school senior classes were used. The most and least participant students in a number of extracurricular activities were selected, and their responses to a questionnaire were analyzed.

The original research behind this scale plans to incorporate it into a group of related auxiliary scales. The scale itself appears to measure the following items:

- (1) Self confidence
- (2) Frankness
- (3) Liking for social interaction
- (4) Intellectual and cultural interests
- (5) Broadminded social outlook
- (6) Satisfaction with living

Harrison G. Gough, California Psychological Inventory Manual, 1957.

200 St-r - Social Status, Revised

The items on this scale are identical with items found on the Cs scale of the California Psychological Inventory. The Cs scale (Capacity for status) was designed to serve as an index of an individual's capacity for status (not his actual or achieved status). The scale attempts to measure the personal qualities and attributes which underlie and lead to status. High Scores (right) indicate ambitious, active, insightful, resourceful persons. Low scores suggest apathetic, shy, conventional, and dull individuals.

Harrison G. Gough, California Psychological Inventory Manual, 1957.

201 Sv - Sexual Deviation

Subjects for this study were male sex offenders convicted of some sex offense and who were in the state hospital for observation, diagnosis, and treatment. Almost 60 percent had records of one or more previous convictions. Charges included indecent exposure, child molestation, rape, and homosexual contacts with minors.

Distribution of 145 Normals and 200 Sex
Deviates on a 100-Item Sexual
Deviation Scale

MMPI Scale Score	Frequency	
	Normals (N-145)	Sex Offenders (N-200)
66-70		2
61-65		3
56-60		14
51-55		26
46-50		31
41-45	2	30
36-40	4	36
31-35	12	38
26-30	22	9
21-25	38	9
16-20	39	2
11-15	25	
6-10	3	
0-5		
Mean	21.3	42.1
SD	6.5	9.3

The best cutoff point to distinguish these groups seem to lie between 30 and 31 items.

When MMPI scale scores were compared for these extremes, it was found that those with high sexual deviation scores also had significantly higher scores on the F, D, Pa, Pt, and Sc scales. A significant difference was also found for the K scale, high deviation scores being associated with low K values.

205 To - Tolerance

The items on this scale are identical with items found on the To scales of the California Psychological Inventory. This scale To (Tolerance) was designed to identify persons with permissive, accepting, and non-judgmental social beliefs and attitudes.

Harrison G. Gough, California Psychological Inventory Manual, 1957.

206 Tp - Teaching Potentiality

The study reported here is directed toward predicting the initial success of teaching candidates going into the field rather than evaluating the competence of those of considerable experience.

From the MMPI answer sheets of 661 males and 1059 females who passed through the teacher selection process at the Teachers Selection and Counseling Service of the School of Education University of Minnesota, were used as a basis for this scale.

J. C. Gowan and May S. Gowan, Journal of Educational Research, 1955, 49, 1-12.

210 Un - Underachievement

An achievement scale was constructed which consists of 24 items of the MMPI which distinguished a group of freshman males of the University of Wisconsin who had been clients of the Student Counseling Center and extreme overachievers in their first semester's work from a similar group of extreme underachievers.

J. P. McQuary and W. E. Truax, Journal of Educational Research, 1955, 48, 393-399.

MINISTERIAL EFFECTIVENESS SCALE

For.....

Date.....

To.....Your Position.....

In what capacity have you known this person?.....How long?.....

We are asking your assistance in estimating this person's qualifications as a minister. Please block out the square on each scale which you feel indicates the degree of his development in terms of the particular category described.

Where you feel you have no basis for judgment, please place a large "X" through the entire statement. What you indicate on this form will be kept confidential and will not be communicated to the student or go outside the Seminary offices.

1. Quality of Religious Life.

The vitality of his personal Christian commitment.

Scale 0-9 Low High

2. Christian Influence.

His influence in inspiring faith in others.

Scale 0-9 Low High

3. Personal Habits.

Courtesy neatness and manners.

Scale 0-9 Low High

4. General Culture.

Esthetic sensitivity; appreciation for cultural pursuits.

Scale 0-9 Low High

5. Personal Integrity.

The degree of his dependability, honesty, sincerity, reliability.

Scale 0-9 Low High

6. Financial Responsibility.

Evidence of concern for financial obligations and responsible effort to meet them promptly.

Scale 0-9 Low High

7. Social Participation.

How active was he in his participation in the life of the community where you have known him?

Scale 0-9 Low High

8. Intellectual Growth.

Evidence of intellectual growth and critical thought.

Scale 0-9 Low High

9. Theological Alertness.

Interest in theological discussion and awareness of theological issues and trends.

Scale 0-9 Low High

10. Common Sense.

Ability to "size-up" situations quickly and accurately; to use "good judgment"; and to exercise self-control.

Scale 0-9 Low High

11. Empathy.

Insight into the way the other person views things; capacity to "feel with" him; and to understand his meanings.

Scale 0-9 Low High

12. Emotional Stability.

Ability to meet problems under pressure.

Scale 0-9 Low High

13. Social Conscience.

Moral sensitivity to social issues in contemporary society.

Scale 0-9 Low High

14. Ability To Communicate.

Evidence that through written or spoken word he is able to organize and communicate his ideas clearly, coherently, and concisely.

Scale 0-9 Low High

15. Administrative Skill.

Ability in organizing and leading groups of individuals.

Scale 0-9 Low High

16. Attitude Toward Other Churches.

The degree of his cooperation with other churches and his responsible action in interfaith activity.

Scale 0-9 Low High

17. General Impression.

How would you rate this person as to his potential effectiveness in the ministry?

Scale 0-9 Low High

18. Other Impressions You May Have. (Please write on other side.)

Signed.....Address.....

APPENDIX B

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 3

TABLE XXIII

DEPENDENT VARIABLE IS NOW 35
NUMBER OF VARIABLES DELETED 16
VARIABLES DELETED... 1 2 3 22 23 24 25 26 27 28 29 30 31 32 33 34

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	18	5.25613	0.29201	1.71088
DEVIATION ABOUT REGRESSION...	28	4.77894	0.17068	
TOTAL...	46	10.03507		

INTERCEPT (A VALUE) IS 1.09231

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
13	CLNMF	29.27560	5.21162	0.03965	0.01617	2.45232	0.42048
9	CLND	19.31915	4.88612	-0.02227	0.02513	-0.88612	-0.16516
18	CLNSCK	26.44681	5.22040	0.02071	0.09241	0.22408	0.04231
11	CLNPD	15.82979	3.39641	-0.08480	0.28925	-0.29316	-0.05532
10	CLNHY	22.51064	4.20596	-0.02012	0.02873	-0.70037	-0.13121
14	CLNPA	10.17021	2.48753	0.02271	0.03197	0.71048	0.13307
7	CLNHS	4.46809	3.59257	-0.51863	0.30527	-1.69893	-0.30570
4	CLNL	3.25532	1.93894	-0.02823	0.04661	-0.60566	-0.11372
8	CLNHSK	13.25532	3.58419	0.50658	0.29593	1.71181	0.30780
6	CLNK	17.17021	4.50757	0.26357	0.35894	0.73430	0.13745
19	CLNMA	15.12766	3.91550	0.43635	0.30481	1.43156	0.26115
20	CLNMAK	18.59574	3.82020	-0.41527	0.30239	-1.37329	-0.25121
15	CLNPT	10.06383	7.07231	0.43117	0.25570	1.68623	0.30362
16	CLNPTK	27.27660	5.05493	-0.41500	0.25137	-1.65096	-0.29784
5	CLNF	3.00000	2.50217	0.01272	0.03899	0.32636	0.06156
12	CLNPK	22.74468	3.69175	0.05423	0.29748	0.18231	0.03443
17	CLNSC	9.14894	6.15728	0.00651	0.09196	0.07082	0.01338
21	CLNSI	25.21277	9.56655	-0.00072	0.01704	-0.04197	-0.00793
DEPENDENT							
35	GPA	2.84894	0.46707				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.00072

INCREMENTS FOR INDEPENDENT VARIABLES

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE
13	CLNMF	1.30336	0.12988	6.71704	0.44050
9	CLND	0.84269	0.08397	4.69998	0.42343
18	CLNSCK	0.90974	0.09066	5.60502	0.40288
11	CLNPD	0.29026	0.02892	1.82252	0.39908
10	CLNHY	0.22855	0.02278	1.45045	0.39695
14	CLNPA	0.15417	0.01536	0.97790	0.39706
7	CLNHS	0.03840	0.00383	0.23896	0.40089
4	CLNL	0.04023	0.00401	0.24545	0.40483
8	CLNHSK	0.06033	0.00601	0.36195	0.40827

CUMULATIVE REGRESSIONS

SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
1.30336	0.12988	6.71704	0.36077	0.36
2.14605	0.21385	5.98460	0.48244	0.48
3.05579	0.30451	6.27568	0.55143	0.55
3.34605	0.33344	5.25242	0.57744	0.58
3.57460	0.35621	4.53709	0.59603	0.60
3.72877	0.37157	3.94185	0.61957	0.62
3.76718	0.37540	3.34854	0.61271	0.61
3.80740	0.37941	2.90400	0.61590	0.61
3.86773	0.38542	2.57821	0.62082	0.62

TABLE XXIII (Continued)

6	CLNK	0.34162	0.03404	2.11106	0.40228	4.20936	0.41946	2.60117	0.64766	.02
19	CLNMA	0.03642	0.00363	0.22017	0.40670	4.24578	0.42309	2.33349	0.65045	.21
20	CLNMAK	0.50419	0.05024	3.24358	0.39426	4.74997	0.47334	2.54645	0.65799	.21
15	CLNPT	0.02649	0.00264	0.16624	0.39919	4.77646	0.47598	2.30572	0.65991	.04
16	CLNPTK	0.44199	0.04404	2.93646	0.38797	5.21846	0.52002	2.47641	0.72113	.01
5	CLNF	0.02960	0.00295	0.19171	0.39296	5.24806	0.52297	2.26571	0.72317	.03
12	CLNPK	0.00707	0.00070	0.04438	0.39916	5.25513	0.52368	2.06140	0.72366	-.09
17	CLNSC	0.00070	0.00007	0.00425	0.40596	5.25583	0.52375	1.87600	0.72370	.21
21	CLNSI	0.00030	0.00003	0.00176	0.41313	5.25613	0.52378	1.71088	0.72372	.07

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 6

TABLE XXIV

183

DEPENDENT VARIABLE IS NOW 35
NUMBER OF VARIABLES DELETED 23
VARIABLES DELETED... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 33 34

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	11	2.75822	0.25075	1.20604
DEVIATION ABOUT REGRESSION...	35	7.27685	0.20791	
TOTAL...	46	10.03507		

INTERCEPT (A VALUE) IS -0.88125

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
28	RESDO	18.14894	3.00708	0.05018	0.04862	1.03195	0.17184
27	RESDY	18.74468	8.45311	0.01472	0.01948	0.75525	0.12663
23	RESR	15.72340	3.89929	0.02594	0.01942	1.33564	0.22022
24	RESES	49.89362	5.31297	0.00824	0.02472	0.33349	0.05628
25	RESLB	9.93617	2.67358	-0.03601	0.02721	-1.32344	-0.21831
30	RESPR	6.27660	3.68134	0.03358	0.02992	1.12229	0.18638
29	RESRE	22.70213	2.66144	0.06031	0.04392	1.37320	0.22610
32	RESCN	25.17021	4.66401	0.03332	0.03314	1.00523	0.16751
26	RESCA	8.68085	5.26311	-0.01114	0.02773	-0.40180	-0.06776
31	RESST	22.21277	3.36178	-0.00902	0.02556	-0.35296	-0.05955
22	RESA	9.42553	7.43302	-0.00415	0.02964	-0.13995	-0.02365
35	GPA	2.84894	0.46707				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.00415

INCREMENTS FOR INDEPENDENT VARIABLES

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	CUMULATIVE SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SAMPLE R
28	RESDO	0.59768	0.05956	2.84990	0.45795	0.59768	0.05956	2.84990	0.24415	0.24
27	RESDY	0.60791	0.06058	3.02940	0.44796	1.20559	0.12014	3.02391	0.34661	0.35
23	RESR	0.33478	0.03336	1.69465	0.44447	1.54037	0.15350	2.59911	0.39179	0.37
24	RESES	0.41048	0.04090	2.13257	0.43873	1.95085	0.19440	2.53382	0.44091	0.46
25	RESLB	0.22052	0.02198	1.14976	0.43795	2.17137	0.21638	2.26423	0.46816	0.48
30	RESPR	0.13450	0.01340	0.69605	0.43958	2.30587	0.22978	1.98888	0.47935	0.48
29	RESRE	0.18825	0.01876	0.97358	0.43972	2.49412	0.24854	1.84271	0.49854	0.53
32	RESCN	0.18755	0.01869	0.96918	0.43990	2.68167	0.26723	1.73225	0.51894	0.52
26	RESCA	0.04404	0.00439	0.22296	0.44447	2.72571	0.27162	1.53306	0.52117	0.52
31	RESST	0.02843	0.00283	0.14059	0.44972	2.75415	0.27445	1.36177	0.52388	0.52
22	RESA	0.00407	0.00041	0.01959	0.45597	2.75822	0.27486	1.20604	0.52427	0.52

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

PROBLEM NUMBER G3,5
 REPLACEMENT AND DELETION 9

TABLE XXV

DEPENDENT VARIABLE IS NOW 35
 NUMBER OF VARIABLES DELETED 5
 VARIABLES DELETED... 1 2 3 33 34

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	29	6.90732	0.23818	1.29458
DEVIATION ABOUT REGRESSION...	17	3.12775	0.18399	
TOTAL...	46	10.03507		

INTERCEPT (A VALUE) IS -2.64953

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
13	CLNMF	29.27660	5.21162	0.03058	0.02254	1.35661	0.31254
24	RESES	49.89362	5.31297	0.03277	0.03052	1.07380	0.25203
18	CLNSCK	26.44681	5.22040	-0.01418	0.11475	-0.12355	-0.02995
25	RESLB	9.93617	2.67358	-0.07394	0.05674	-1.30310	-0.30136
9	CLND	19.31915	4.88612	-0.04203	0.04211	-0.99806	-0.23527
23	RESR	15.72340	3.89929	0.04564	0.03218	1.41792	0.32520
32	RESCN	25.17021	4.66401	0.01361	0.04094	0.33247	0.08038
14	CLNPA	10.17021	2.48753	0.02238	0.05090	0.43962	0.10602
12	CLNPK	22.74468	3.69175	-0.05571	0.47297	-0.11779	-0.02855
28	RESDO	18.14894	3.00708	0.05196	0.05934	0.87574	0.20776
15	CLNPT	10.06383	7.07231	0.02641	0.39408	0.06702	0.01625
8	CLNHSI	25.25532	3.58419	0.33802	0.38182	0.88528	0.20993
30	RESPR	6.27660	3.68134	0.03508	0.06282	0.55845	0.13422
20	CLNMAK	18.59574	3.82020	-0.17171	0.45627	-0.37633	-0.09089
7	CLNHS	4.46809	3.59257	-0.31245	0.40224	-0.77678	-0.12514
17	CLNSC	9.14894	6.15728	0.04182	0.12773	0.32741	0.07916
19	CLNMA	15.12766	3.91550	0.19885	0.45673	0.43537	0.10501
27	RESDY	18.74468	8.45311	-0.00826	0.02522	-0.32762	-0.07921
29	RESRE	22.70213	2.66144	0.01371	0.05379	0.25496	0.06172
31	RESST	22.21277	3.36178	-0.00890	0.03880	-0.22924	-0.05551
22	RESA	9.42553	7.43302	0.01117	0.04680	0.23862	0.05778
6	CLNK	17.17021	4.50757	-0.02048	0.43724	-0.04685	-0.01136
5	CLNF	3.00000	2.50217	0.00870	0.04906	0.17736	0.04298
4	CLNL	3.25532	1.93894	-0.00946	0.06162	-0.15347	-0.03720
10	CLNHY	22.51064	4.20596	-0.00322	0.03855	-0.08362	-0.02028
11	CLNPD	15.82279	3.39641	0.03134	0.45759	0.06850	0.01661
26	RESCA	8.68085	5.26311	0.00215	0.04331	0.04972	0.01206
21	CLNSI	25.21277	9.56655	-0.00025	0.02216	-0.01123	-0.00272
16	CLNPTK	27.27660	5.05493	0.00053	0.40573	0.00130	0.00031
DEPENDENT							
35	GPA	2.84894	0.46707				

COMPARE CHECK ON FINAL COEFFICIENT..... 0.00052

TABLE XXV (Continued)

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VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
13	CLNMF	1.30336	0.12988	6.71704	0.44050	1.30336	0.12988	6.71704	0.38039	0.36
24	RESES	1.10108	0.10972	6.34909	0.41644	2.40444	0.23960	6.93229	0.48949	0.46
18	CLNSCK	0.66686	0.06645	4.11773	0.40243	3.07130	0.30606	6.32158	0.50322	0.48
25	RESLB	1.00818	0.10047	7.10991	0.37656	4.07948	0.40652	7.19234	0.57759	0.50
9	CLND	0.49243	0.04907	3.69557	0.36503	4.57191	0.45559	6.86227	0.67478	0.55
23	RESR	0.31930	0.03182	2.48298	0.35860	4.89121	0.48741	6.33923	0.59815	0.57
32	RESCN	0.58459	0.05825	5.00055	0.34191	5.47580	0.54567	6.69143	0.73869	0.62
14	CLNPA	0.17638	0.01758	1.52924	0.33962	5.55218	0.56324	6.12561	0.75050	0.67
12	CLNPK	0.22561	0.02248	2.00792	0.33520	5.87779	0.58572	5.81251	0.75533	0.69
28	RESDO	0.09366	0.00933	0.82973	0.33597	6.15982	0.61383	5.05759	0.71347	0.64
15	CLNPT	0.18837	0.01877	1.70132	0.33275	6.23441	0.62126	4.64765	0.78820	0.60
8	CLNHSK	0.07459	0.00743	0.66727	0.33434	6.32864	0.63065	4.33430	0.74414	0.60
30	RESPR	0.09423	0.00939	0.83898	0.33514	6.44100	0.64185	4.09623	0.80116	0.71
20	CLNMAK	0.11236	0.01120	1.00044	0.33513	6.54742	0.65245	3.87979	0.81775	0.67
7	CLNHS	0.10642	0.01060	0.94591	0.33542	6.71148	0.66880	3.78627	0.81780	0.71
17	CLNSC	0.16405	0.01635	1.48081	0.33285	6.80561	0.67818	3.59490	0.82352	0.71
19	CLNMA	0.09414	0.00938	0.84532	0.33371	6.82873	0.68049	3.31296	0.82492	0.68
27	RESDY	0.02312	0.00230	0.20190	0.33840	6.84742	0.68235	3.05258	0.82604	0.68
29	RESRE	0.01869	0.00186	0.15830	0.34360	6.84742	0.68235	2.81742	0.82720	0.68
31	RESST	0.01926	0.00192	0.15801	0.34909	6.86668	0.68427	2.60603	0.82851	0.68
22	RESA	0.02168	0.00216	0.17224	0.35478	6.88836	0.68643	2.39501	0.82889	0.68
6	CLNK	0.00626	0.00062	0.04786	0.36173	6.89462	0.68705	2.20079	0.82920	0.68
5	CLNF	0.00527	0.00053	0.03866	0.36920	6.89989	0.68758	2.02150	0.82947	0.67
4	CLNL	0.00438	0.00044	0.03075	0.37724	6.90426	0.68801	1.85345	0.82954	0.68
10	CLNHY	0.00120	0.00012	0.00802	0.38604	6.90546	0.68813	1.69841	0.82962	0.68
11	CLNPD	0.00141	0.00014	0.00899	0.39549	6.90686	0.68827	1.55404	0.82965	0.68
26	RESCA	0.00043	0.00004	0.00262	0.40573	6.90730	0.68832	1.41969	0.82965	0.68
21	CLNSI	0.00002	0.00000	0.00013	0.41685	6.90732	0.68832	1.29450	0.82965	0.68
16	CLNPTK	0.00000	0.00000	0.00000	0.42894					

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

0.

TABLE XXVI

PROBLEM NUMBER G3,6
REPLACEMENT AND DELETION 3

DEPENDENT VARIABLE IS NOW 37
NUMBER OF VARIABLES DELETED 2
VARIABLES DELETED... 35 36

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	34	8.17835	0.24054	1.55461
DEVIATION ABOUT REGRESSION...	12	1.85672	0.15473	
TOTAL...	46	10.03507		

-INTERCEPT (A VALUE) IS

-0.48598

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
				0.06754	0.05570	1.21257	0.33038
21	EXPOR	12.95745	2.86628	-0.05776	0.05636	-1.02492	-0.28371
26	EXPRP	21.12766	3.01890	-0.00497	0.04219	-0.11772	-0.03395
11	EXPES	50.46808	5.38053	-0.12130	0.07865	-1.54222	-0.40672
12	EXPGR	10.34043	2.18967	-0.02058	0.09426	-0.21836	-0.06291
29	EXPSP	18.61702	3.38509	-0.15190	0.08428	-1.80234	-0.46155
34	EXPUN	11.38298	1.59555	0.25520	0.09880	2.58295	0.59775
24	EXPRER	16.53191	1.94323	-0.08304	0.05289	-1.55999	-0.41280
2	EXPAE	14.80851	2.68359	-0.11426	0.06553	-1.74366	-0.44961
4	EXPHSX	12.19149	1.86079	0.02004	0.09656	0.20749	0.05979
1	EXPAC	15.04255	2.17653	0.10518	0.22436	0.46879	0.13410
32	EXPTO	24.12766	3.39832	-0.15835	0.12830	-1.23427	-0.33564
25	EXPRGM	5.63830	1.35816	-0.14363	0.05200	-2.76208	-0.62343
10	EXPEO	11.55319	3.24244	-0.13308	0.08455	-1.57393	-0.41365
30	EXPSTR	12.42553	1.98631	-0.09404	0.05518	-1.70434	-0.44146
20	EXPNU	10.59574	4.68884	0.09582	0.05392	1.77686	0.45640
9	EXPEM	10.87234	5.52708	0.08437	0.04885	1.72720	0.44621
17	EXPLP	36.19149	6.39170	0.03197	0.05321	0.60077	0.17088
7	EXPDY	18.74468	8.45311	0.01926	0.04296	0.44835	0.12835
23	EXPPV	15.74468	6.53242	-0.00420	0.05148	-0.08157	-0.02354
15	EXPIE	32.42553	3.46250	-0.09691	0.12016	-0.80646	-0.22674
5	EXPDE	2.14894	1.41389	0.04906	0.03088	1.58871	0.41687
31	EXPSV	27.97872	8.39381	-0.03874	0.05141	-0.75350	-0.21255
13	EXPHC	5.78723	3.14114	-0.06869	0.04461	-1.53985	-0.40619
3	EXPAT	13.34043	8.05761	-0.03427	0.03305	-1.03698	-0.28678
18	EXPMP	12.80851	4.19958	0.15572	0.19367	0.80403	0.22609
22	EXPPR	6.27660	3.68134	0.08810	0.11300	0.77968	0.21958
6	EXPDOR	10.65957	2.37996	0.01401	0.09168	0.15278	0.04406
19	EXPNO	5.74468	3.17235	0.05673	0.07533	0.75308	0.21243
16	EXPIM	6.38298	3.01123	0.05081	0.08739	0.58143	0.16553
14	EXPHR	12.78723	1.73125	0.01902	0.03943	0.48237	0.13792
33	EXPTP	76.61702	12.89009	-0.02740	0.07784	-0.35203	-0.10110
27	EXPSF	23.70213	2.81570	-0.00542	0.05862	-0.09240	-0.02666
8	EXPEC	11.78723	3.77023	-0.00416	0.05818	-0.07143	-0.02061
28	EXPSOR	32.40425	4.94606				
DEPENDENT							
37	GPA	2.84894	0.46707				

-0.00416

COMPARE CHECK ON FINAL COEFFICIENT.....

TABLE XXVI (Continued)

INCREMENTS FOR INDEPENDENT VARIABLES

CUMULATIVE

REGRESSIONS

NO.	VARIABLE NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	
									R	SIMPLE R
									0.26787	.29
21	EXPOR	0.83161	0.08287	4.06612	0.45224	0.83161	0.08287	4.06612	0.26787	.29
26	EXPRP	1.04914	0.10455	5.66105	0.43049	1.88075	0.18742	5.07417	0.43292	-.24
11	EXPES	0.86568	0.08627	5.10716	0.41171	2.74643	0.27368	5.40093	0.52315	.15
12	EXPGR	0.49093	0.04892	3.03320	0.40231	3.23735	0.32260	5.00053	0.58798	-.07
29	EXPSP	0.34828	0.03471	2.21405	0.39661	3.58563	0.35731	4.55887	0.54775	.09
34	EXPUN	0.36705	0.03658	2.41383	0.38995	3.95268	0.39389	4.33237	0.62760	-.18
24	EXPRER	0.35510	0.03539	2.41805	0.38321	4.30778	0.42927	4.19054	0.65519	.23
2	EXPAE	0.53954	0.05377	3.95211	0.36949	4.84732	0.48304	4.43829	0.69501	-.14
4	EXPHSX	0.41091	0.04095	3.18281	0.35931	5.25823	0.52399	4.52541	0.72387	-.17
1	EXPAC	0.12377	0.01233	0.95762	0.35952	5.38200	0.53632	4.16397	0.73234	.12
32	EXPTO	0.20953	0.02088	1.65039	0.35631	5.59153	0.55720	4.00385	0.75452	-.02
25	EXPRGM	0.12139	0.01210	0.95495	0.35654	5.71293	0.56930	3.74505	0.78454	-.01
10	EXPEO	0.15273	0.01522	1.20885	0.35545	5.86566	0.58452	3.57119	0.78192	-.03
30	EXPSTR	0.26976	0.02688	2.21361	0.34909	6.13542	0.61140	3.59618	0.78192	.02
20	EXPNU	0.20186	0.02012	1.69230	0.34537	6.33728	0.63151	3.54186	0.79468	.02
9	EXPEM	0.16895	0.01684	1.43630	0.34297	6.50623	0.64835	3.45700	0.80520	.02
17	EXPLP	0.37397	0.03727	3.43761	0.32983	6.88021	0.68562	3.72023	0.82802	-.03
7	EXPDY	0.27847	0.02775	2.71074	0.32051	7.15868	0.71337	3.87142	0.84461	.04
23	EXPPV	0.12553	0.01251	1.23208	0.31919	7.28421	0.72587	3.76291	0.85198	.02
15	EXPIE	0.07798	0.00777	0.75858	0.32051	7.36219	0.73365	3.58072	0.85653	.14
5	EXPDE	0.05808	0.00579	0.55528	0.31919	7.42027	0.73943	3.37833	0.85990	-.10
31	EXPSV	0.14019	0.01397	1.35962	0.32341	7.42027	0.73943	3.33295	0.85799	-.02
13	EXPHC	0.04635	0.00462	0.43904	0.32111	7.56046	0.75340	3.13262	0.87064	.06
3	EXPAT	0.06949	0.00692	0.64811	0.32493	7.56046	0.75340	2.98316	0.87461	.03
18	EXPMP	0.15238	0.01518	1.45028	0.32493	7.60681	0.75802	2.98316	0.87461	.03
22	EXPPR	0.13894	0.01385	1.34404	0.32744	7.67630	0.76495	2.98046	0.88325	-.12
6	EXPDOR	0.04767	0.00475	0.44847	0.32744	7.82867	0.78013	2.96447	0.89105	-.03
19	EXPNO	0.04133	0.00412	0.37603	0.32414	7.96761	0.79398	2.96447	0.89105	-.03
16	EXPIM	0.02750	0.00274	0.23959	0.32152	7.96761	0.79398	2.79257	0.89372	.06
14	EXPHR	0.02835	0.00283	0.23597	0.32152	8.01528	0.79873	2.79257	0.89372	.06
33	EXPTP	0.04144	0.00413	0.33039	0.32604	8.05661	0.80285	2.61783	0.89602	.04
27	EXPSF	0.02065	0.00206	0.15539	0.33153	8.05661	0.80285	2.42904	0.89754	.07
8	EXPEC	0.00301	0.00030	0.00510	0.33877	8.08411	0.80559	2.25041	0.89912	.02
28	EXPSOR	0.00079	0.00008	0.00510	0.34664	8.11247	0.80841	2.09733	0.90141	-.07
					0.35413	8.15390	0.81254	1.92224	0.90255	-.12
					0.36455	8.17455	0.81450	1.92224	0.90255	-.12
					0.37800	8.17756	0.81490	1.73429	0.90272	.23
					0.39335	8.17835	0.81498	1.55461	0.90275	-.11

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 2

TABLE XXVII

DEPENDENT VARIABLE IS NOW 34
NUMBER OF VARIABLES DELETED 16
VARIABLES DELETED... 1 2 3 22 23 24 25 26 27 28 29 30 31 32 33 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	18	17.47080	0.97060	1.27810
DEVIATION ABOUT REGRESSION...	28	21.26346	0.75941	
TOTAL...	46	38.73425		

INTERCEPT (A VALUE) IS 3.70086

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
20	CLNMAK	18.59574	3.82020	0.09362	0.63785	0.14677	0.02773
14	CLNPA	10.17021	2.48753	-0.10550	0.06744	-1.55443	-0.28352
19	CLNMA	15.12766	3.91550	-0.02016	0.64295	-0.03135	-0.00593
21	CLNSI	25.21277	9.56655	0.03358	0.03595	0.93414	0.17385
12	CLNPK	22.74468	3.69175	0.04153	0.62749	0.06618	0.01251
9	CLND	19.31915	4.88612	-0.05246	0.05301	-0.98957	-0.18382
15	CLNPT	10.06383	7.07231	0.02858	0.53936	0.05299	0.01001
7	CLNHS	4.46809	3.59257	-1.31536	0.64393	-2.04272	-0.36013
10	CLNHY	22.51064	4.20596	0.08239	0.06060	1.35967	0.24887
8	CLNHSK	13.25532	3.58419	1.20202	0.62423	1.92561	0.34197
6	CLNK	17.17021	4.50757	-0.62906	0.75712	-0.83085	-0.15511
5	CLNF	3.00000	2.50217	-0.04486	0.08224	-0.54541	-0.10253
4	CLNL	3.25532	1.93894	0.03718	0.09832	0.37817	0.07129
18	CLNSCK	25.44681	5.22040	0.04291	0.19493	0.22014	0.04157
11	CLNPD	15.82979	3.39641	-0.08808	0.61013	-0.14436	-0.02727
17	CLNSC	9.14894	6.15728	-0.02395	0.19397	-0.12347	-0.02333
16	CLNPTK	27.27660	5.05493	0.03795	0.53023	0.07157	0.01352
13	CLNMF	29.27660	5.21162	-0.00226	0.03410	-0.06636	-0.01254
DEPENDENT							
34	PEERAT	6.71574	0.91763				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.00226

INCREMENTS FOR INDEPENDENT VARIABLES

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE
20	CLNMAK	4.34997	0.11230	5.69297	0.87413
14	CLNPA	2.41804	0.06243	3.32832	0.85235
19	CLNMA	1.31380	0.03392	1.84304	0.84430
21	CLNSI	1.70581	0.04404	2.47504	0.83018
12	CLNPK	1.44125	0.03721	2.14836	0.81906
9	CLND	0.63995	0.01652	0.95283	0.81953
15	CLNPT	0.60602	0.01565	0.90005	0.82056
7	CLNHS	0.37843	0.00977	0.55564	0.82527
10	CLNHY	1.34073	0.03461	2.02146	0.81440

CUMULATIVE REGRESSIONS

SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	Simple R
4.34997	0.11230	5.69297	0.33512	.34
6.76801	0.17473	4.65792	0.41511	-.21
8.08182	0.20865	3.77913	0.45678	.28
9.78763	0.25269	3.55033	0.51268	.02
11.22888	0.28990	3.34759	0.53342	-.02
11.86883	0.30642	2.94526	0.55355	-.13
12.47485	0.32206	2.64678	0.56751	-.04
12.85328	0.33183	2.35903	0.57605	-.15
14.19401	0.36645	2.37786	0.60535	.07

TABLE XXVII (Continued)

8	CLNHSK	0.51649	0.01333	0.77398	0.81690	14.71051	0.37978	2.20440	0.61826	0.05
6	CLNK	2.42186	0.06252	3.92396	0.78562	17.13236	0.44231	2.52349	0.68506	0.13
5	CLNF	0.17068	0.00441	0.27078	0.79393	17.30304	0.44671	2.28757	0.68836	0.03
4	CLNL	0.06315	0.00163	0.09753	0.80468	17.36620	0.44834	2.06300	0.68988	0.01
18	CLNSCK	0.07536	0.00195	0.11325	0.81572	17.44156	0.45029	1.87230	0.67103	0.20
11	CLNPD	0.01298	0.00033	0.01890	0.82852	17.45453	0.45062	1.69517	0.67128	0.07
17	CLNSC	0.00977	0.00025	0.01377	0.84202	17.46430	0.45087	1.53952	0.67147	0.06
16	CLNPTK	0.00315	0.00008	0.00430	0.85635	17.46745	0.45096	1.41112	0.67150	0.04
13	CLNMF	0.00334	0.00009	0.00440	0.87144	17.47080	0.45104	1.27810	0.67150	0.01

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 5

TABLE XXVIII

DEPENDENT VARIABLE IS NOW 34
NUMBER OF VARIABLES DELETED 23
VARIABLES DELETED... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 33 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	11	8.27605	0.75237	0.86456
DEVIATION ABOUT REGRESSION...	35	30.45820	0.87023	
TOTAL...	46	38.73425		

INTERCEPT (A VALUE) IS 3.68255

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
26	RESCA	8.68085	5.26311	-0.04502	0.05673	-0.79360	-0.13295
30	RESPR	6.27660	3.68134	0.12388	0.06122	2.02364	0.32365
25	RESLB	9.93617	2.67358	0.06831	0.05567	1.22720	0.20311
31	RESST	22.21277	3.36178	0.02602	0.05228	0.49766	0.08382
24	RESES	49.89362	5.31297	0.03789	0.05057	0.74916	0.12563
23	RESR	15.72340	3.89929	-0.02045	0.03973	-0.51473	-0.08668
32	RESCN	25.17021	4.66401	0.06269	0.06780	-0.68253	-0.11461
28	RESDO	18.14894	3.00708	0.02095	0.09948	0.63014	0.10591
22	RESA	9.42553	7.43302	-0.01638	0.06064	0.34540	0.05828
29	RESRE	22.70213	2.66144	0.00120	0.08985	-0.18230	-0.03080
27	RESDY	18.74468	8.45311	0.00120	0.03986	0.03013	0.00509
DEPENDENT 34	PEERAT	6.71574	0.91763	0.00120			

COMPARE CHECK ON FINAL COEFFICIENT.....

INCREMENTS FOR INDEPENDENT VARIABLES

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	CUMULATIVE SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
26	RESCA	1.53070	0.03952	1.85148	0.90926	1.53070	0.03952	1.85148	0.1979	-0.20
30	RESPR	3.64675	0.09415	4.78166	0.87330	5.17746	0.13367	3.39436	0.35500	.12
25	RESLB	1.18595	0.03062	1.57536	0.86765	6.36340	0.16428	2.81762	0.41532	.19
31	RESST	0.79443	0.02051	1.05668	0.86708	7.15783	0.18479	2.38017	0.42488	.17
24	RESES	0.39069	0.01009	0.51364	0.87214	7.54852	0.19488	1.98481	0.44145	.14
23	RESR	0.22595	0.00583	0.29192	0.87977	7.77447	0.20071	1.67410	0.44801	-.08
32	RESCN	0.15436	0.00399	0.19543	0.88875	7.92883	0.20470	1.43401	0.45244	.00
28	RESDO	0.20273	0.00523	0.25174	0.89740	7.92883	0.20470	1.26214	0.45518	.10
22	RESA	0.11548	0.00298	0.14015	0.90773	8.13156	0.20993	1.11209	0.45143	-.15
29	RESRE	0.02821	0.00073	0.03335	0.91983	8.24705	0.21291	0.97807	0.45221	.01
27	RESDY	0.00079	0.00002	0.00091	0.93286	8.27605	0.21366	0.86456	0.45224	-.16

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 8

TABLE XXIX

DEPENDENT VARIABLE IS NOW 34
NUMBER OF VARIABLES DELETED 5
VARIABLES DELETED... 1 2 3 33 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	29	29.10873	1.00375	1.77276
DEVIATION ABOUT REGRESSION...	17	9.62553	0.56621	
TOTAL...	46	38.73425		

INTERCEPT (A VALUE) IS -4.72951

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
20	CLNMAK	18.59574	3.82020	0.63423	0.81043	0.79237	0.18873
14	CLNPA	10.17021	2.48753	0.07163	0.03929	0.80226	0.19100
19	CLNMA	15.12766	3.91550	-0.49559	0.83123	-0.61853	-0.14836
30	RESPR	6.27660	3.68134	0.23244	0.11020	2.10928	0.45544
12	CLNPK	22.74468	3.69175	-0.75298	0.83972	-0.90751	-0.21496
24	RESES	49.89362	5.31297	0.06282	0.03353	1.17357	0.27375
11	CLNPD	15.82979	3.39641	0.63175	0.83274	0.78700	0.18749
31	RESST	22.21277	3.36178	0.14367	0.03807	2.11061	0.45567
21	CLNSI	25.21277	9.56655	0.08860	0.03888	2.27910	0.48377
27	RESDY	18.74468	8.45311	-0.12450	0.04425	-2.81348	-0.56365
16	CLNPTK	27.27660	5.05493	-0.01619	0.71176	-0.02274	-0.00552
26	RESCA	8.68085	5.26311	-0.14523	0.07597	-1.91161	-0.42062
10	CLNHY	22.51064	4.20596	0.10539	0.06763	1.55840	0.35356
25	RESLB	9.93617	3.89929	-0.10304	0.09954	-1.33111	-0.30723
23	RESR	15.72340	4.88612	0.10392	0.05646	-1.82506	-0.40476
9	CLND	19.31915	6.15728	-0.29814	0.07388	-1.40665	-0.32289
17	CLNSC	9.14894	7.43302	0.12174	0.22407	-1.33056	-0.30711
22	RESA	9.42553	5.21162	0.04163	0.08210	1.48292	0.33844
13	CLNMF	29.27660	5.22040	0.17720	0.03954	1.05281	0.24741
18	CLNSCK	26.44681	1.93894	-0.06897	0.20130	0.88028	0.20879
4	CLNL	3.25532	4.66401	-0.07130	0.10810	-0.63801	-0.15292
32	RESCN	25.17021	4.50757	-0.30256	0.07182	-0.99273	-0.23408
6	CLNK	17.17021	3.58419	0.98332	0.76704	-0.39446	-0.09524
8	CLNHSK	13.25532	3.59257	-1.01576	0.66983	1.46802	0.33542
7	CLNHS	4.46809	2.66144	-0.06256	0.70564	-1.43950	-0.32962
29	RESRE	22.70213	3.00708	0.04402	0.09436	-0.65302	-0.15877
28	RESDO	18.14894	7.07231	0.11175	0.10409	0.42290	0.10203
15	CLNPT	10.06383	2.50217	0.00320	0.69133	0.16164	0.03917
5	CLNF	3.00000			0.08606	0.03716	0.00901
DEPENDENT							
34	PEERAT	6.71574	0.91763				

COMPARE CHECK ON FINAL COEFFICIENT..... 0.00320

INCREMENTS FOR INDEPENDENT VARIABLES

CUMULATIVE REGRESSIONS

TABLE XXIX (Continued)

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	* * STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE	SIMPLE R
20	CLNMAK	4.34997	0.11230	5.69297	0.87413	4.34997	0.11230	5.69297	0.30512	.34
14	CLNPA	2.41804	0.06243	3.32832	0.85235	6.76801	0.17473	4.65792	0.41801	-.21
19	CLNMA	1.31380	0.03392	1.84304	0.84430	8.08182	0.20865	3.77913	0.45578	.28
30	RESPR	2.99792	0.07740	4.55306	0.81144	11.07974	0.28504	4.25681	0.53453	.12
12	CLNPK	1.77812	0.04591	2.81736	0.79444	12.85786	0.33195	4.07454	0.57415	-.02
24	RESES	1.47513	0.03808	2.41813	0.78105	14.33299	0.37003	3.91592	0.51830	.14
11	CLNPD	0.73011	0.01885	1.20291	0.77907	15.06310	0.38888	3.54537	0.52301	-.09
31	RESST	0.71448	0.01845	1.18267	0.77725	15.77758	0.40733	3.26456	0.53822	.17
21	CLNSI	0.50500	0.01304	0.83224	0.77897	16.28258	0.42037	2.98149	0.54835	-.02
27	RESDY	0.60143	0.01553	0.99090	0.77907	16.88401	0.43589	2.78177	0.56122	-.16
16	CLNPTK	1.47536	0.03809	2.53437	0.76298	18.35937	0.47399	2.86707	0.56846	-.04
26	RESCA	0.73883	0.01907	1.27928	0.75995	19.09820	0.49306	2.75572	0.71215	.20
10	CLNHY	1.66324	0.04294	3.05389	0.73799	20.76144	0.53600	2.93232	0.71212	.07
25	RESLB	1.68760	0.04357	3.31608	0.71338	22.44903	0.57957	3.15084	0.71109	.19
23	RESR	0.64765	0.01672	1.28391	0.71024	23.09668	0.59529	3.05247	0.72220	-.08
9	CLND	0.87717	0.02265	1.78281	0.70144	23.97385	0.61893	3.04536	0.75172	-.13
17	CLNSC	0.71104	0.01836	1.46769	0.69603	24.58489	0.63729	2.99725	0.74930	.04
22	RESA	1.06625	0.02753	2.29952	0.68094	25.75113	0.66482	3.08534	0.71536	-.15
13	CLNMF	0.85016	0.02195	1.89190	0.67035	26.60129	0.68676	3.11563	0.82871	-.01
18	CLNSCK	0.33449	0.00864	0.73712	0.67364	26.93579	0.69540	2.96789	0.83391	.20
4	CLNL	0.26859	0.00693	0.58237	0.67911	27.20437	0.70233	2.89889	0.81805	.01
32	RESCN	0.48334	0.01248	1.05012	0.67843	27.68772	0.71481	2.73432	0.84547	.00
6	CLNK	0.12661	0.00327	0.26667	0.68904	27.81433	0.71808	2.54712	0.84740	.13
8	CLNHSK	0.07430	0.00192	0.15071	0.70213	27.88862	0.72000	2.35713	0.84853	-.05
7	CLNHS	0.90523	0.02337	1.91238	0.68801	28.79285	0.74337	2.43319	0.85219	-.15
29	RESRE	0.19486	0.00503	0.39989	0.69805	28.98871	0.74840	2.28812	0.85510	.01
28	RESDO	0.10524	0.00272	0.20741	0.71231	29.09395	0.75112	2.12374	0.85567	.10
15	CLNPT	0.01400	0.00036	0.02618	0.73130	29.10795	0.75148	1.94387	0.85668	-.06
5	CLNF	0.00078	0.00002	0.00138	0.75247	29.10873	0.75150	1.77276	0.85669	-.03

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

0.

DEPENDENT VARIABLE IS NOW 36
 NUMBER OF VARIABLES DELETED 2
 VARIABLES DELETED... 35 37

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	34	21.37975	0.62882	0.43480
DEVIATION ABOUT REGRESSION...	12	17.35450	1.44621	
TOTAL...	46	38.73425		

INTERCEPT (A VALUE) IS -5.34741

NO.	VARIABLE NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
34	EXPUN	11.38298	1.59555	-0.47271	0.25766	-1.83465	-0.46803
27	EXPSF	23.70213	5.81570	0.05315	0.23797	0.22334	0.06434
22	EXPPR	6.27660	3.68134	0.51913	0.59210	0.87676	0.24536
12	EXPGR	10.34043	2.18967	-0.31063	0.24047	-1.29179	-0.34940
14	EXPHR	12.78723	1.73125	0.39795	0.26718	1.48943	0.39500
1	EXPAC	15.04255	2.17653	-0.22736	0.29522	-0.77016	-0.21703
20	EXPNU	10.59574	4.68884	-0.17028	0.16869	-1.00942	-0.27976
6	EXPDOR	10.65957	2.37996	0.40970	0.34546	1.18596	0.32390
10	EXPEO	11.55319	3.24244	-0.16431	0.15898	-1.03353	-0.28590
4	EXPHSX	12.19149	1.86079	-0.21053	0.20035	-1.05084	-0.29029
3	EXPAT	13.34043	8.05761	-0.20207	0.13637	-1.48172	-0.39327
28	EXPSOR	32.40425	4.94606	-0.07937	0.17787	-0.44621	-0.12776
13	EXPHC	5.78723	3.14114	-0.06762	0.15719	-0.43019	-0.12324
9	EXPEM	10.87234	5.52708	0.17703	0.16486	1.07379	0.29608
31	EXPSV	27.97872	8.39381	0.10089	0.09440	1.06866	0.29479
23	EXPPV	15.74468	6.53242	0.11212	0.13134	0.85365	0.23927
33	EXPTP	76.61702	12.89009	0.08307	0.12054	0.68919	0.19513
18	EXPMP	12.80851	4.19958	-0.06029	0.10103	-0.59676	-0.16977
2	EXPAE	14.80851	2.68359	-0.04560	0.16171	-0.28200	-0.06114
24	EXPRER	16.53191	1.94323	0.20822	0.30206	0.68934	0.19517
21	EXPOR	12.95745	2.86628	-0.04223	0.17029	-0.24801	-0.07141
32	EXPTO	24.12766	3.39832	0.38602	0.63592	0.56278	0.16036
7	EXPDY	18.74468	8.45311	0.02958	0.16269	0.18182	0.05241
11	EXPES	50.46808	5.38053	-0.04592	0.12899	-0.35601	-0.10223
19	EXPNO	5.74468	3.17235	0.01095	0.28029	0.03908	0.01123
17	EXPLP	36.19149	6.39170	0.05723	0.14934	0.38324	0.10996
25	EXPRGM	5.63830	1.35816	-0.09391	0.39224	-0.23941	-0.06895
29	EXPSP	18.61702	3.38509	-0.09328	0.28818	-0.32368	-0.09303
16	EXPIM	6.38298	3.01123	0.10077	0.23029	0.43759	0.12533
30	EXPSTR	12.42553	1.98631	-0.09946	0.25849	-0.38479	-0.11040
5	EXPDE	2.14894	1.41389	-0.10669	0.36737	-0.29043	-0.08335
26	EXPRP	21.12766	3.01890	0.02766	0.17230	0.15052	0.04629
15	EXPIE	32.42553	3.46250	0.01620	0.15738	0.10292	0.02970
8	EXPEC	11.78723	3.77023	-0.00011	0.17922	-0.00059	-0.00017
DEPENDENT							
36	PEERAT	6.71574	0.91763				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.00011

TABLE XXX (Continued)

INCREMENTS FOR INDEPENDENT VARIABLES				CUMULATIVE REGRESSIONS						
VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
						2.54313	0.06824	3.29557	0.28122	-.26
34	EXPUN	2.54313	0.06824	3.29557	0.89556	3.83552	0.09902	2.41789	0.31468	.18
27	EXPSF	1.19239	0.03078	1.50336	0.89059	8.24629	0.21289	3.87684	0.45143	.12
22	EXPPR	4.41077	0.11387	6.22092	0.84203	10.28906	0.26563	3.79801	0.51540	.02
12	EXPGR	2.04277	0.05274	3.01620	0.82296	11.73664	0.30300	3.56478	0.55046	.10
14	EXPHR	1.44758	0.03737	2.19837	0.81147	12.17163	0.31423	3.05483	0.55057	.03
1	EXPAC	0.43499	0.01123	0.65504	0.81490	12.93520	0.33395	2.79342	0.57788	-.11
20	EXPNU	0.76356	0.01971	1.15427	0.81334	14.26164	0.36819	2.76811	0.61679	.06
6	EXPDOR	1.32644	0.03424	2.05964	0.80251	14.92748	0.38538	2.57778	0.62079	-.05
10	EXPEO	0.66584	0.01719	1.03483	0.80214	15.48485	0.39977	2.39772	0.63227	.00
4	EXPHSX	0.55738	0.01439	0.86305	0.80363	15.95634	0.41194	2.22892	0.64183	-.16
3	EXPAT	0.47148	0.01217	0.72447	0.80672	16.97282	0.43819	2.20986	0.65196	.05
28	EXPSOR	1.01649	0.02624	1.58816	0.80003	17.34462	0.44779	2.05841	0.65917	.06
13	EXPHC	0.37180	0.00960	0.57361	0.80509	17.85473	0.46095	1.95459	0.67894	-.06
9	EXPEM	0.51011	0.01317	0.78179	0.80777	18.54665	0.47882	1.89868	0.69197	-.06
31	EXPSV	0.69192	0.01786	1.06251	0.80698	18.78035	0.48485	1.76472	0.69831	-.20
23	EXPPV	0.23369	0.00603	0.35135	0.81556	19.05744	0.49200	1.65219	0.71143	.01
33	EXPTP	0.27710	0.00715	0.40839	0.82372	19.40293	0.50092	1.56132	0.72776	.10
18	EXPMP	0.34549	0.00892	0.50041	0.83091	19.62024	0.50653	1.45869	0.71171	.05
2	EXPAE	0.21731	0.00561	0.30697	0.84138	19.84729	0.51240	1.36610	0.71582	-.00
24	EXPRER	0.22705	0.00586	0.31257	0.85230	20.07380	0.51824	1.28064	0.71989	-.10
21	EXPOR	0.22651	0.00585	0.30346	0.86395	20.21922	0.52200	1.19132	0.72249	-.09
32	EXPTO	0.14542	0.00375	0.18850	0.87833	20.35160	0.52542	1.10711	0.72486	-.16
7	EXPDY	0.13238	0.00342	0.16563	0.89401	20.48749	0.52892	1.02923	0.72727	.15
11	EXPES	0.13589	0.00351	0.16385	0.91071	20.61942	0.53233	0.95614	0.72961	.02
19	EXPNO	0.13193	0.00341	0.15294	0.92877	20.84875	0.53825	0.89668	0.73366	.05
17	EXPLP	0.22933	0.00592	0.25644	0.94566	20.90908	0.53981	0.82545	0.73472	-.05
25	EXPRGM	0.06034	0.00156	0.06431	0.96859	21.01522	0.54255	0.76244	0.73658	-.03
29	EXPSP	0.10613	0.00274	0.06431	0.99216	21.08138	0.54426	0.70006	0.73774	-.06
16	EXPIM	0.06616	0.00171	0.10782	1.01902	21.19609	0.54722	0.64457	0.73974	.06
30	EXPSTR	0.11471	0.00296	0.06371	1.04696	21.34096	0.55096	0.59369	0.74227	-.14
5	EXPDE	0.14488	0.00171	0.10465	1.07683	21.36301	0.55153	0.53803	0.74265	.05
26	EXPRP	0.02205	0.00057	0.12494	1.11391	21.37975	0.55196	0.48531	0.74294	.00
15	EXPIE	0.01674	0.00043	0.01777	1.15541	21.37975	0.55196	0.43480	0.74294	.02
8	EXPEC	0.00000	0.00000	0.00000	1.20258					

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

0.

TABLE XXXI

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 1

DEPENDENT VARIABLE IS NOW 33
NUMBER OF VARIABLES DELETED 16
VARIABLES DELETED... 1 2 3 22 23 24 25 26 27 28 29 30 31 32 34 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	18	19.55378	1.08632	1.86220
DEVIATION ABOUT REGRESSION...	28	16.33391	0.58335	
TOTAL...	46	35.88770		

INTERCEPT (A VALUE) IS 4.26512

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
20	CLNMAK	18.59574	3.82020	-1.16347	0.55905	-2.08116	-0.36601
14	CLNPA	10.17021	2.48753	-0.18925	0.05911	-3.20190	-0.51770
16	CLNPTK	27.27660	5.05493	-0.28797	0.46472	-0.61967	-0.11631
7	CLNHS	4.46809	3.59257	-0.72745	0.56437	-1.28895	-0.23667
13	CLNMF	29.27660	5.21162	0.02936	0.02989	0.98219	0.18250
21	CLNSI	25.21277	9.56655	-0.04733	0.03151	-1.50236	-0.27313
19	CLNMA	15.12766	3.91550	1.19447	0.56352	2.11967	0.37186
10	CLNHY	22.51064	4.20596	0.08187	0.05311	1.54153	0.27969
8	CLNHSK	13.25532	3.58419	0.54800	0.54711	1.00163	0.18599
9	CLND	19.31915	4.89612	0.04434	0.04646	0.95433	0.17749
15	CLNPT	10.06383	7.07231	0.39104	0.47273	0.82720	0.15445
18	CLNSCK	26.44681	5.22040	0.11071	0.17085	0.64802	0.12156
11	CLNPD	15.82979	3.39641	-0.87612	0.53475	-1.63837	-0.29577
12	CLNPK	22.74468	3.69175	0.86828	0.54997	1.57878	0.28591
5	CLNF	3.00000	2.50217	-0.01992	0.07208	-0.27634	-0.05215
17	CLNSC	9.14894	6.15728	-0.07079	0.17001	-0.41641	-0.07845
6	CLNK	17.17021	4.50757	-0.17115	0.66358	-0.25791	-0.04868
4	CLNL	3.25532	1.93894	-0.01377	0.08617	-0.15976	-0.03018
DEPENDENT 33	FACRAT	6.35106	0.88327				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.01377

INCREMENTS FOR INDEPENDENT VARIABLES

CUMULATIVE REGRESSIONS

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	Sample R
20	CLNMAK	3.39499	0.09460	4.70182	0.84974	3.39499	0.09460	4.70182	0.30797	.31
14	CLNPA	2.89939	0.08079	4.31088	0.82011	6.29436	0.17539	4.67932	0.41867	-.25
16	CLNPTK	1.83670	0.05118	2.84539	0.80343	8.13109	0.22657	4.19884	0.47590	.11
7	CLNHS	2.53341	0.07059	4.21847	0.77495	10.56450	0.29716	4.43946	0.54513	-.20
13	CLNMF	0.52534	0.01464	0.87211	0.77614	11.18985	0.31180	3.71517	0.55854	.07
21	CLNSI	1.21762	0.03393	2.07429	0.76616	12.40746	0.34573	3.52281	0.58799	-.09
19	CLNMA	2.02154	0.05633	3.67404	0.74177	14.42900	0.40206	3.74628	0.63405	.30
10	CLNHY	0.98411	0.02742	1.82646	0.73403	15.41311	0.42948	3.57576	0.65535	-.04
8	CLNHSK	0.68044	0.01896	1.27191	0.73142	16.09355	0.44844	3.34252	0.66966	-.20

TABLE XXXI (Continued)

9	CLND	0.67719	0.01887	1.27524	0.72872	16.77074	0.46731	3.15817	0.68360	.04
15	CLNPT	0.29022	0.00809	0.53954	0.73342	17.06096	0.47540	2.88339	0.68949	.08
18	CLNSCK	0.35479	0.00989	0.65304	0.73708	17.41575	0.48528	2.67133	0.69662	.10
11	CLNPD	0.30530	0.00851	0.55458	0.74196	17.72106	0.49379	2.47620	0.70270	.01
12	CLNPDK	1.61748	0.04507	3.12760	0.71914	19.33853	0.53886	2.67097	0.73407	.03
5	CLNF	0.08564	0.00239	0.16127	0.72875	19.42418	0.54125	2.43832	0.73570	.07
17	CLNSC	0.04824	0.00134	0.08816	0.73971	19.47242	0.54259	2.22420	0.73661	.11
6	CLNK	0.06648	0.00185	0.11792	0.75083	19.53889	0.54445	2.03875	0.73787	.01
4	CLNL	0.01489	0.00041	0.02552	0.76378	19.55378	0.54486	1.86220	0.73815	.14

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 4

TABLE XXXII

DEPENDENT VARIABLE IS NOW 33
NUMBER OF VARIABLES DELETED 23
VARIABLES DELETED... 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 34 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	11	10.66258	0.96933	1.34495
DEVIATION ABOUT REGRESSION...	35	25.22511	0.72072	
TOTAL...	46	35.88770		

INTERCEPT (A VALUE) IS -1.03878

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
32	RESCN	25.17021	4.66401	-0.02142	0.06171	-0.34710	-0.05857
28	RESDD	18.14894	3.00708	0.15945	0.09053	1.76131	0.28534
30	RESPR	6.27660	3.68134	0.07231	0.05571	1.29786	0.21428
24	RESES	49.89362	5.31297	0.06627	0.04602	1.43988	0.23648
22	RESA	9.42553	7.43302	0.09307	0.05519	1.68652	0.27415
25	RESLB	9.93617	2.67358	0.06176	0.05066	1.21924	0.20185
26	RESCA	8.68085	5.26311	-0.05690	0.05163	-1.10201	-0.18312
23	RESR	15.72340	3.89929	-0.02514	0.03616	-0.69518	-0.11670
27	RESDY	18.74468	8.45311	0.01559	0.03628	0.42969	0.07244
29	RESRE	22.70213	2.66144	0.02431	0.08177	0.29727	0.05018
31	RESST	22.21277	3.36178	-0.00770	0.04758	-0.16192	-0.02736
DEPENDENT							
33	FACRAT	6.35106	0.88327				

COMPARE CHECK ON FINAL COEFFICIENT..... -0.00770

INCREMENTS FOR INDEPENDENT VARIABLES

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	CUMULATIVE SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE CORR. COEFF. R	SIMILAR R
32	RESCN	3.71269	0.10345	5.19257	0.84558	3.71269	0.10345	5.19257	0.32164	0.32
28	RESDD	1.59777	0.04452	2.29916	0.83363	5.31046	0.14797	3.82082	0.34467	0.24
30	RESPR	0.80967	0.02256	1.16959	0.83203	6.12013	0.17054	2.94690	0.41296	0.01
24	RESES	0.89082	0.02482	1.29566	0.82918	7.01095	0.19536	2.54928	0.44199	0.19
22	RESA	1.63504	0.04556	2.46080	0.81513	8.64599	0.24092	2.66252	0.44083	0.0
25	RESLB	0.82163	0.02289	1.24394	0.81271	9.46762	0.26381	2.38899	0.51363	0.0
26	RESCA	0.63114	0.01759	0.95447	0.81318	10.09876	0.28140	2.18173	0.53147	0.0
23	RESR	0.28075	0.00782	0.41823	0.81931	10.37951	0.28922	1.93282	0.53779	0.0
27	RESDY	0.20135	0.00561	0.29438	0.82702	10.58085	0.29483	1.71887	0.54298	0.0
29	RESRE	0.06284	0.00175	0.08961	0.83739	10.64369	0.29658	1.51788	0.54469	0.0
1	RESST	0.01890	0.00053	0.02622	0.84895	10.66258	0.29711	1.34495	0.54518	0.0

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

PROBLEM NUMBER G3,5
REPLACEMENT AND DELETION 7

TABLE XXXIII

DEPENDENT VARIABLE IS NOW 33
NUMBER OF VARIABLES DELETED 5
VARIABLES DELETED... 1 2 3 34 35

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	29	24.60116	0.84832	1.27775
DEVIATION ABOUT REGRESSION...	17	11.28653	0.66391	
TOTAL...	46	35.88770		

INTERCEPT (A VALUE) IS -1.71622

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
32	RESCN	25.17021	4.66401	0.00185	0.07777	0.02379	0.00577
7	CLNHS	4.46809	3.59257	-0.75510	0.76410	-0.98822	-0.23308
18	CLNSCK	26.44681	5.22040	0.23358	0.21798	1.07161	0.25155
14	CLNPA	10.17021	2.48753	-0.09457	0.09669	-0.97810	-0.23082
10	CLNHY	22.51064	4.20596	-0.02573	0.07323	-0.35137	-0.08491
16	CLNPTK	27.27660	5.05493	-1.02948	0.77073	-1.33572	-0.30819
23	RESR	15.72340	3.89929	-0.06028	0.06114	-0.98589	-0.23256
28	RESDO	18.14894	3.00708	0.17490	0.11272	1.55169	0.35222
22	RESA	9.42553	7.43302	0.13758	0.08890	1.54756	0.35140
4	CLNL	3.25532	1.93894	0.04529	0.11705	0.38690	0.09343
29	RESRE	22.70213	2.66144	0.04952	0.10218	0.48465	0.11574
30	RESPR	6.27660	3.68134	0.20432	0.11933	1.71219	0.38352
21	CLNSI	25.21277	9.56655	-0.01004	0.04210	-0.23852	-0.05775
13	CLNMF	29.27660	5.21162	0.06793	0.04282	1.58653	0.35912
9	CLND	19.31915	4.88612	0.01785	0.08000	0.22313	0.05404
11	CLNPD	15.82979	3.39641	-1.46934	0.86925	-1.69035	-0.37933
12	CLNPK	22.74468	3.69175	1.47961	0.89847	1.64682	0.37092
15	CLNPT	10.06383	7.07231	1.05701	0.74860	1.41198	0.32399
31	RESST	22.21277	3.36178	-0.08699	0.07371	-1.18019	-0.27519
17	CLNSC	9.14894	6.15728	-0.31453	0.24263	-1.29631	-0.29993
19	CLNMA	15.12766	3.91550	0.58542	0.86761	0.67475	0.16150
8	CLNHSK	13.25532	3.58419	0.56127	0.72532	0.77382	0.18446
25	RESLB	9.93617	2.67358	0.08936	0.10779	0.82902	0.19712
20	CLNMAK	18.59574	3.82020	-0.53545	0.86674	-0.61778	-0.14818
26	RESCA	8.68085	5.26311	0.02988	0.08227	0.36315	0.08774
6	CLNK	17.17021	4.50757	0.21263	0.83059	0.25600	0.06197
24	RESES	49.89362	5.31297	-0.01138	0.05797	-0.19635	-0.04757
27	RESDY	18.74468	8.45311	-0.00660	0.04792	-0.13774	-0.03339
5	CLNF	3.00000	2.50217	0.00470	0.09319	0.05044	0.01223
DEPENDENT							
33	FACRAT	6.35106	0.88327				

COMPARE CHECK ON FINAL COEFFICIENT..... 0.00470

INCREMENTS FOR INDEPENDENT VARIABLES

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CUMULATIVE REGRESSIONS

TABLE XXXIII (Continued)

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
32	RESCN	3.71269	0.10345	5.19257	0.84558	3.71269	0.10345	5.19257	0.32164	.32
7	CLNHS	3.01265	0.08395	4.54547	0.81411	6.72534	0.18740	5.07358	0.43290	.20
18	CLNSCK	1.87665	0.05229	2.95745	0.79659	8.60199	0.23969	4.51868	0.4958	.14
14	CLNPA	2.14377	0.05974	3.58120	0.77370	10.74576	0.29943	4.48774	0.54720	-.25
10	CLNHV	1.54896	0.04316	2.69180	0.75858	12.29473	0.34259	4.27317	0.5531	-.04
16	CLNPTK	1.27951	0.03565	2.29370	0.74688	13.57424	0.37824	4.05562	0.551	.11
23	RESR	1.40349	0.03911	2.61770	0.73222	14.97773	0.41735	3.99079	0.54503	.22
28	RESDO	0.77293	0.02154	1.45858	0.72796	15.75066	0.43889	3.71532	0.5249	.24
22	RESA	1.84020	0.05128	3.72127	0.70321	17.59086	0.49016	3.95249	0.5112	.05
4	CLNL	0.67082	0.01869	1.37011	0.69972	18.26168	0.50886	3.72983	0.71364	.14
29	RESRE	0.34412	0.00959	0.69693	0.70269	18.60581	0.51845	3.42557	0.72003	-.04
30	RESPR	0.62685	0.01747	1.27967	0.69990	19.23266	0.53591	3.27184	0.72205	.06
21	CLNSI	0.45680	0.01273	0.93062	0.70061	19.58946	0.54864	3.08558	0.74010	-.05
13	CLNMF	0.56235	0.01567	1.15089	0.69901	20.25181	0.56431	2.96049	0.75121	.07
9	CLND	0.47099	0.01312	0.96279	0.69942	20.72279	0.57743	2.82409	0.75989	.04
11	CLNPD	0.18779	0.00523	0.37615	0.70657	20.91058	0.58267	2.61782	0.75323	.01
12	CLNPK	0.27777	0.00774	0.54800	0.71195	21.18835	0.59041	2.45894	0.75838	.03
15	CLNPT	0.51403	0.01432	1.01463	0.71177	21.70238	0.60473	2.37987	0.75754	.05
31	RESST	0.64131	0.01787	1.27845	0.70826	22.34369	0.62260	2.34433	0.75925	.18
17	CLNSC	0.56834	0.01584	1.13882	0.70644	22.91204	0.63844	2.29550	0.75912	.11
19	CLNMA	0.54620	0.01522	1.09860	0.70511	23.45823	0.65366	2.24680	0.75849	.30
8	CLNHSK	0.31715	0.00884	0.62841	0.71041	23.77538	0.66249	2.14130	0.75194	-.20
25	RESLB	0.33788	0.00942	0.66002	0.71549	24.11326	0.67191	2.04793	0.74970	.08
20	CLNMAK	0.29713	0.00828	0.56954	0.72229	24.41039	0.68019	1.94960	0.72474	.31
26	RESCA	0.10841	0.00302	0.20024	0.73578	24.51880	0.68321	1.81159	0.82556	-.02
6	CLNK	0.04390	0.00122	0.07752	0.75250	24.56270	0.68443	1.66838	0.82730	.01
24	RESES	0.02271	0.00063	0.03818	0.77127	24.58540	0.68507	1.53074	0.82769	.19
27	RESDY	0.01407	0.00039	0.02244	0.79191	24.59947	0.68546	1.40092	0.82792	.04
5	CLNF	0.00169	0.00005	0.00254	0.81481	24.60116	0.68550	1.27775	0.82795	.04

PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES 0.

TABLE XXXIV

PROBLEM NUMBER G3,6
REPLACEMENT AND DELETION 1

DEPENDENT VARIABLE IS NOW 35
NUMBER OF VARIABLES DELETED 2
VARIABLES DELETED... 36 37

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	34	31.10613	0.91489	2.29603
DEVIATION ABOUT REGRESSION...	12	4.78157	0.39846	
TOTAL...	46	35.88770		

INTERCEPT (A VALUE) IS -23.97927

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
31	EXPSV	27.97872	8.39381	-0.02795	0.04955	-0.56408	-0.16072
33	EXPTP	76.61702	12.89009	-0.00999	0.06327	-0.15786	-0.04553
19	EXPNO	5.74468	3.17235	-0.01061	0.14712	-0.07210	-0.02081
22	EXPPR	6.27660	3.68134	1.15097	0.31080	3.70331	0.73030
16	EXPIM	6.38298	3.01123	-0.15137	0.12088	-1.25221	-0.33996
11	EXPES	50.46808	5.38053	-0.15417	0.06771	-2.27712	-0.54930
27	EXPSF	23.70213	5.81570	0.07454	0.12491	0.59673	0.16976
23	EXPPV	15.74468	6.53242	0.06343	0.06894	0.92012	0.25672
14	EXPHR	12.78723	1.73125	-0.16902	0.14025	-1.20514	-0.32858
18	EXPMP	12.80851	4.19958	-0.10324	0.05303	-1.94678	-0.48992
20	EXPNU	10.59574	4.68884	0.15690	0.08855	1.77198	0.45541
7	EXPDY	18.74468	8.45311	0.09948	0.08540	1.16486	0.31873
24	EXPRER	16.53191	1.94323	0.54703	0.15855	3.45017	0.70568
28	EXPSOR	32.40425	4.94606	0.05578	0.09337	0.59746	0.16996
25	EXPRGM	5.63830	1.35816	-0.38233	0.20589	-1.85701	-0.47247
10	EXPEO	11.55319	3.24244	-0.15506	0.08345	-1.85812	-0.47269
17	EXPLP	36.19149	6.39170	0.05006	0.07839	0.63860	0.15129
3	EXPAT	13.34043	8.05761	-0.23826	0.07158	-3.32852	-0.69285
32	EXPTO	24.12766	3.39832	1.23036	0.36004	3.41726	0.70228
4	EXPHSX	12.19149	1.86079	-0.19650	0.10516	-1.86852	-0.47474
2	EXPAE	14.80851	2.68359	-0.06564	0.08488	-0.77334	-0.21788
12	EXPGR	10.34043	2.18967	-0.32696	0.12622	-2.59033	-0.59835
6	EXPDR	10.65957	2.37996	-0.04299	0.18133	1.78254	0.45755
26	EXPRP	21.12766	3.01890	-0.02655	0.09044	-0.47531	-0.13594
15	EXPIE	32.42553	2.37996	0.17919	0.08261	0.33858	0.09728
1	EXPAC	15.04255	1.59555	0.04579	0.13525	1.05779	0.29205
34	EXPUN	11.38298	5.52708	0.09154	0.08654	1.05779	0.29205
9	EXPEM	10.87234	3.38509	-0.13591	0.15126	-0.89851	-0.25107
29	EXPSP	18.61702	3.38509	-0.12654	0.08938	-1.41568	-0.37830
21	EXPOR	12.95745	2.86628	0.06104	0.08251	0.73921	0.20886
13	EXPHC	5.78723	3.14114	-0.16641	0.19283	-0.85296	-0.24173
5	EXPDE	2.14894	1.41389	0.05528	0.09407	0.58767	0.16726
8	EXPEC	11.78723	3.77023	-0.01510	0.13568	-0.11128	-0.03211
30	EXPSTR	12.42553	1.98631				
DEPENDENT							
35	FACRAT	6.35106	0.88327				

-0.01510

COMPARE CHECK CN FINAL COEFFICIENT.....

DEPENDENT VARIABLE IS NOW 35
 NUMBER OF VARIABLES DELETED 2
 VARIABLES DELETED... 36 37

ANALYSIS OF VARIANCE FOR REGRESSION

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARES	F VALUE
DUE TO REGRESSION.....	34	31.10613	0.91489	2.29603
DEVIATION ABOUT REGRESSION...	12	4.78157	0.39846	
TOTAL....	46	35.88770		

INTERCEPT (A VALUE) IS -23.97927

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	REG. COEF.	STD. ERROR OF REG. COEF.	COMPUTED T VALUE	PARTIAL CORR. COEF.
31	EXPSV	27.97872	8.39381	-0.02795	0.04955	-0.56408	-0.16072
33	EXPTP	76.61702	12.89009	-0.00999	0.06327	-0.15786	-0.04553
19	EXPNO	5.74468	3.17235	-0.01061	0.14712	-0.07210	-0.02081
22	EXPPR	6.27660	3.68134	1.15097	0.31080	3.70331	0.73030
16	EXPIM	6.38298	3.01123	-0.15137	0.12088	-1.25221	-0.33996
11	EXPES	50.46808	5.38053	-0.15417	0.06771	-2.27712	-0.54930
27	EXPSF	23.70213	5.81570	0.07454	0.12491	0.59673	0.15976
23	EXPPV	15.74468	6.53242	0.06343	0.06894	0.92012	0.25672
14	EXPHR	12.78723	1.73125	-0.16902	0.14025	-1.20514	-0.32858
18	EXPMP	12.80851	4.19958	-0.10324	0.05303	-1.94678	-0.48992
20	EXPNU	10.59574	4.68884	0.15690	0.08855	1.77198	0.45541
7	EXPDY	18.74468	8.45311	0.09948	0.08540	1.16486	0.31873
24	EXPRER	16.53191	1.94323	0.54703	0.15855	3.45017	0.70568
28	EXPSOR	32.40425	4.94606	0.05578	0.09337	0.59746	0.16996
25	EXPRGM	5.63830	1.35816	-0.38233	0.20589	-1.85701	-0.47247
10	EXPEO	11.55319	3.24244	-0.15506	0.08345	-1.85812	-0.47269
17	EXPLP	36.19149	6.39170	0.05006	0.07839	0.63860	0.18129
3	EXPAT	13.34043	8.05761	-0.23826	0.07158	-3.32852	-0.69286
32	EXPTO	24.12766	3.39832	1.23036	0.36004	3.41726	0.70228
4	EXPHSX	12.19149	1.86079	-0.19650	0.10516	-1.86852	-0.47474
2	EXPAE	14.80851	2.68359	-0.06564	0.08488	-0.77334	-0.21788
12	EXPGR	10.34043	2.18967	-0.32696	0.12622	-2.59033	-0.59886
6	EXPDDR	10.65957	2.37996	0.32323	0.18133	1.78254	0.45755
26	EXPRP	21.12766	3.01890	-0.04299	0.09044	-0.47531	-0.13594
15	EXPIE	32.42553	3.46250	-0.02655	0.08261	-0.32142	-0.09239
1	EXPAC	15.04255	2.17653	0.17919	0.15496	1.15636	0.31664
34	EXPUN	11.38298	1.59555	0.04579	0.13525	0.33858	0.09728
9	EXPDM	10.87234	5.52708	0.09154	0.08654	1.05779	0.29205
29	EXPSP	18.61702	3.38509	-0.13591	0.15126	-0.89851	-0.25107
21	EXPOR	12.95745	2.86628	-0.12654	0.08938	-1.41568	-0.37830
13	EXPHC	5.78723	3.14114	0.06104	0.08251	0.73981	0.20586
5	EXPDE	2.14894	1.41389	-0.16641	0.19283	-0.85296	-0.24173
8	EXPEC	11.78723	3.77023	0.05528	0.09407	0.58767	0.16726
30	EXPSTR	12.42553	1.98631	-0.01510	0.13568	-0.11126	-0.03211
DEPENDENT							
35	FACRAT	6.35106	0.88327				

COMPARE CHECK CN FINAL COEFFICIENT..... -0.01510

TABLE XXXIV (Continued)

INCREMENTS FOR INDEPENDENT VARIABLES

CUMULATIVE REGRESSIONS

VARIABLE NO.	NAME	SUMS OF SQUARES	PROP. VAR.	F VALUE EACH TERM	STD. ERROR OF ESTIMATE	SUMS OF SQUARES	PROP. VAR. = R SQ.	F VALUE	MULTIPLE R	SIMPLE R
31	EXPSV	1.46342	0.04078	1.91301	0.87463	1.46342	0.04078	1.91301	0.20194	0.20
33	EXPTP	6.20665	0.17295	9.67809	0.80082	7.67008	0.21372	5.98001	0.41230	0.63
19	EXPNO	1.64949	0.04596	2.66967	0.78604	9.31957	0.25969	5.02785	0.51959	0.70
22	EXPPR	1.49131	0.04155	2.49773	0.77270	10.81088	0.30124	4.52660	0.58885	0.80
16	EXPIM	2.33985	0.06520	4.21929	0.74469	13.15073	0.36644	4.74270	0.65344	0.87
11	EXPES	1.08369	0.03020	2.00189	0.73575	14.23442	0.39664	4.38253	0.62979	0.87
27	EXPSF	0.84624	0.02358	1.58616	0.73042	15.08066	0.42022	4.03810	0.60404	0.83
23	EXPPV	1.68332	0.04691	3.34485	0.70941	16.76397	0.46712	4.16388	0.62345	0.89
14	EXPHR	1.52762	0.04257	3.21220	0.68962	18.29160	0.50969	4.27361	0.71393	0.94
18	EXPMP	0.46552	0.01297	0.97830	0.68982	18.75712	0.52266	3.94182	0.73245	0.90
20	EXPNU	0.24070	0.00671	0.49879	0.69467	18.99782	0.52937	3.57893	0.71758	0.87
7	EXPDY	0.41826	0.01165	0.86336	0.69519	19.41608	0.54102	3.33982	0.74504	0.84
24	EXPRER	0.52300	0.01457	1.08217	0.69458	19.93909	0.55560	3.17361	0.74556	0.83
28	EXPSOR	0.51058	0.01423	1.05833	0.68441	20.44967	0.56982	3.02772	0.75497	0.82
25	EXPRGM	0.91709	0.02555	1.95784	0.67868	21.36675	0.59538	3.04098	0.77161	0.84
10	EXPEO	0.70258	0.01958	1.52531	0.67758	22.06933	0.61496	2.99458	0.78419	0.81
17	EXPLP	0.50389	0.01404	1.09752	0.67547	22.57322	0.62900	2.89214	0.78309	0.87
3	EXPAT	0.53909	0.01502	1.18153	0.66107	23.11231	0.64402	2.81420	0.81251	0.82
32	EXPTO	0.97584	0.02719	1.67600	0.65295	24.08815	0.67121	2.90101	0.81927	0.80
4	EXPHSX	0.71455	0.01991	2.07904	0.63981	24.80271	0.69112	2.90876	0.83134	0.81
2	EXPAE	0.85107	0.02371	2.48297	0.62164	25.65378	0.71483	2.98421	0.84548	0.86
12	EXPGR	0.95950	0.02674	2.48297	0.62164	26.61328	0.74157	3.13040	0.85115	0.86
6	EXPDOR	1.12024	0.03122	3.15980	0.59542	27.73352	0.77279	3.40114	0.87408	0.84
26	EXPRP	0.52044	0.01450	1.49988	0.58906	28.25396	0.78729	3.39270	0.88729	0.82
15	EXPIE	0.37253	0.01038	1.07740	0.58802	28.62649	0.79767	3.31161	0.89312	0.84
1	EXPAC	0.46252	0.01289	1.36061	0.58304	29.08901	0.81056	3.29125	0.90031	0.83
34	EXPUN	0.43166	0.01203	1.28812	0.57888	29.52067	0.82258	3.26272	0.90896	0.83
9	EXPEM	0.23614	0.00658	0.94843	0.57888	29.75681	0.82916	3.12017	0.91163	0.83
29	EXPSP	0.32397	0.00903	1.32065	0.58361	30.08078	0.83819	3.03660	0.91553	0.80
21	EXPOR	0.44276	0.01234	0.75829	0.58445	30.52354	0.85053	3.03482	0.92224	0.84
13	EXPHC	0.25812	0.00719	0.51496	0.57902	30.78166	0.85772	2.91701	0.92813	0.85
5	EXPDE	0.18115	0.00505	0.37584	0.58344	30.96281	0.86277	2.75057	0.93485	0.84
8	EXPEC	0.13838	0.00386	0.01238	0.59311	31.10119	0.86663	2.55970	0.94043	0.81
30	EXPSTR	0.00493	0.00014		0.60679	31.10613	0.86676	2.29603	0.94100	0.81

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PROPORTION OF VARIANCE SPECIFIED TO LIMIT VARIABLES

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