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ABSTRACT

Objective psychological measures, personal historical data, and seven criterion measures of performance were made on 67 physician extenders (MEDEX) in five consecutive classes at a southeastern university training site over a two year period, October 1972-April 1975. Multiple regression analysis was used to identify significant predictors for each of the seven areas of the program evaluated by a grade point average. The predictors varied depending on whether assessment was directed toward academic, psychomotor, or interpersonal skills. These findings suggest that certain psychological measures and personal historical data are important to consider when admitting or counseling students considering technically based physician extender training programs. (Author)

PREDICTING SUCCESS IN A PHYSICIAN EXTENDER

(MEDEX) PROGRAM

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INTRODUCTION

The Problem

Traditional criteria predicting success in higher education have been oriented toward the evaluation of scores earned on scholastic achievement and aptitude entrance examinations. The assumption has been that past academic performance is a good predictor of future academic performance when academic achievement is the measure of success. While it is not the intent of the present study to dispute tradition, it seems reasonable to assume that success, particularly occupational success, depends not only on cognitive ability, but also on character, temperament, and interest, as well as other personality factors.

Scholastic achievement entrance examinations probably do not provide the most useful information for predicting performance in the well defined work environment of technologies characterized by algorithmic tasks and calling for complex interpersonal skills. Most candidates for physician extender[1] training programs are oriented toward psychomotor tasks performed with a high degree of precision.

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[1]Physician extenders are new health practitioners trained in a variety of programs and performing tasks traditionally done by physicians. The medex is one type of physician extender. See page 13 of this dissertation.

The recent growth of technical-occupational programs in institutions of higher education has emphasized the need to develop auxiliary criteria for admissions. These criteria are more specifically directed toward the psychomotor and psycho-social domain of educational goals. They may significantly improve predicting performance for individuals with vocational and technical aspirations related to health care delivery.

The need for alternative entrance criteria is apparent in the emerging health occupations. Physician extender programs enroll action oriented, experienced candidates who are trained in mainly manipulative tasks and interpersonal skills.

Published accounts of entrance criteria for physician extender programs vary from the traditional examinations (e.g. math and verbal scores on SAT; ACT score), and the evaluation of past academic performance to reliance mostly on past experiences.[2,3]

There is not, at present, any systematic non-traditional test battery to assist in the selection of physician extender candidates. Psychological measurements are, however, a part of the selection criteria in 27 per cent of the programs

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[2]National Physician Assistant Program Profile 1975-76 (Washington: Association of Physician Assistant Programs (1974)), pp. 7-8.

[3]Educational Programs for the Physician's Assistant (Chicago: The American Medical Association (1973)), pp. 10-15.

training primary care physician extenders.[4] There are few
adequate reports of any efforts to identify such predictive
criteria.[5,6,7,8]

Analysis of Related Studies

The prediction of success in any area of higher educa-
tion is, at best, a very risky business. Eysenck has esti-
mated that the total literature in this field includes over
a thousand titles, and that an additional three thousand were
done between 1901 and 1947.[9] Lavin reported in 1965 that there
has been an increase in recent years in the concern with

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[4]Forty-five physician extender programs were surveyed.
Thirty-seven reported; ten programs considered psychological
measurements as a selection criterion, nine programs obtained
psychological profiles for other purposes, and eighteen
programs did not administer psychological tests. K.J.
Buhmeyer, "Curriculum Development and Evaluation for the
Physician's Assistant (MEDEX) Program," (Unpublished materi-
als collected for the Medical University of South Carolina,
1974).

[5]LeRoy A. Stone, et al., "Psychological Test Character-
istics Associated with Training Success in a MEDEX (Physician
Extension) Training Program," Psychological Reports 32(1973):
231-234.

[6]LeRoy A. Stone and James D. Brosseau, "Cross-Validation
of a System for Predicting Training Success of MEDEX Trainees,"
Psychological Reports 32(1973):917-918.

[7]Charles A. Heikkinen, "Open-Closed Mindedness and
Physician's Assistants: An Exploratory Study," The Journal
of Medical Education 48(1973):1013-1018.

[8]Eugene C. Nelson, Arthur R. Jacobs, and J. Phillip
Nelson, "A Change in the Characteristics of MEDEX Applicants
and Trainees," The P.A. Journal 4(1974):54-64.

[9]Hans J. Eysenck, "Student Selection by Means of Psycho-
logical Tests - A Critical Survey," The British Journal of
Educational Psychology 17, Part I (1947):21.

predicting academic performance.[10] A few relevant findings are cited here to give perspective in this dissertation.

The results of predictive studies vary considerably. For example, in a representative study by Hills[11] the correlation between high school grade point average and college achievement for 28,000 students was near .55.[12] When the high school grade point average was combined with verbal and mechanical aptitude test scores, the multiple correlation coefficient increased to .64. Burnham and Hewitt reported that high school grades predicted freshman grades at correlations between .40 and .45. When these grades were combined with scores from the College Entrance Boards the correlation increased to between .51 and .54.[13]

Biographical and personal data have been utilized in predicting college success and generally, when combined with achievement tests and past academic performance, they increase predictability. Asher and Gray found that data from a

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[10]David E. Lavin, The Prediction of Academic Performance; A Theoretical Analysis and Review of Research (New York: Russell Sage Foundation, 1965), p.i.

[11]John R. Hills, "Prediction of College Grades for all Public Colleges of a State," The Journal of Educational Measurements 1(1964):157.

[12]Predictive efficiency relates to the standard error of estimate, $SE_{yx} = s_y \sqrt{1-r_{xy}^2}$, where s_y = standard deviation of y, the criterion variable. A correlation coefficient (r) of .20 increases the accuracy of prediction by only 2 per cent. When r=.60 prediction is improved to only 20 per cent.

[13]Paul S. Burnham and Benjamin A. Hewitt, "Secondary School Grades and Other Data as Predictors of Academic Achievement in College," College and University 48(1972):21.

personal history blank contributed significantly to the predictive effectiveness of college achievement.[14] Scott found a moderate relationship between freshman grades and biographical and personal data.[15] Leaf reported that personal data contributed more to the prediction of freshman grades than any of the standard achievement tests used.[16] Mallory and Ivanoff's Life Experience Inventory was the best single predictor of college achievement, at a correlation of .57, among five independent variables which included achievement criteria. The multiple correlation coefficient between college achievement and all five variables was near .70.[17] Gozali and others reported that achievement among a group of university students was significantly related to an internal locus of control as measured by the Rotter Internal-External Control Scale.[18]

Predictors of success using achievement and personality criteria have been studied to a limited extent in health

[14]Eston J. Asher and Florence E. Gray, "Relation of Personal History Data to College Success," The Journal of Psychology 31(1940):517.

[15]Carrie M. Scott, "Background and Personal Data as Factors in the Prediction of Scholastic Success in College," Journal of Applied Psychology 22(1938):42.

[16]Curtis T. Leaf, "Prediction of College Success," The Journal of Experimental Education 8(1940):303.

[17]John P. Mallory and John M. Ivanoff, "Further Uses of Life Experience Inventory in Predicting College Achievement," The Journal of Educational Research 57(1964):523.

[18]Harriet Gozali, et al., "Relationship Between the Internal-External Control Construct and Achievement," The Journal of Educational Psychology 64(1973):12.

science education. In nurse training, Haney, Michael, and

Gershon found that achievement tests were significantly

related to predicting success in formal course work, but not

in ward effectiveness.[19] Two scales of the Minnesota Multi-

phasic Personality Inventory (MMPI), Hypochondriasis and

Psychopathic Deviate, were, however, significantly correlated

in a negative way to ward performance.

Published accounts on predicting success criteria of

candidates enrolled in physician extender programs are quite

limited. The relevant literature is summarized here.

Heikkinen reported that open-mindedness, as measured by

the Rokeach Dogmatism Scale, was significantly correlated to

professional relationships in non-surgical preceptorships,

but not to grade point average.[20]

Stone, and others, reported a multiple regression model

for predicting training success in a MEDEX physician extender

program. They found that fourteen independent variables, five

on the MMPI and nine on the Strong Vocational Interest Blank,

when properly weighted, would predict success of the trainee.[21]

There were, however, 115 independent variables and only

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[19]Russell Haney, William B. Michael, and Arthur Gershon,
"Achievement, Aptitude, and Personality Measures as Predictors
of Success in Nursing Training," Educational and Psychological
Measurements 22(1962):391.

[20]Heikkinen, "Open-Closed-Mindedness and the Physician's
Assistant," 1017.

[21]Stone, "Psychological Test Characteristics Associated
With Training Success in a MEDEX (Physician Extension)
Training Program," 233.

nineteen candidates measured. As expected, the weighted
linear composite of the predictor variables was highly corre-
lated with the dependent variables at R=.99.[22] A cross-
validation of the prediction model resulted in six of the
psychological predictor variables, two on the MMPI and four
on the Strong, remaining significant, where N=18, R=.87;
p<.01.[23] Success on each of the MEDEX studies was defined by
the use of a multidimensional judgement scaling instrument
completed by the faculty.[24]

Nelson, Jacobs, and Nelson computed correlation coeffi-
cients between twenty potential success indicator variables
for forty-seven MEDEX trainees. This resulted in a single
internally consistent scale at r=.89 composed of seven success
variables centered on the preceptor-physician evaluation of
a medex. A test for statistically significant independent
predictor variables identified the most successful trainees
to be older (>26), married, working for an older preceptor,
and oriented toward job satisfaction.[25] No significant
correlations were found between the success variable and
college education, intelligence test scores, advanced

[22]Ibid. p. 232.

[23]Stone, "Cross-Validation of a System for Predicting
Training Success of MEDEX Trainees," 917.

[24]LeRoy A. Stone, et al., "Training Staffs' Multidimen-
sional Perceptions of a Class of MEDEX (Physician Extension)
Trainees: A Method of Grading," Perceptual and Motor Skills
36(1973):395-402.

[25]Nelson, "A Change in Characteristics of MEDEX Appli-
cants and Trainees," 62.

military medical school training, or civilian medical experience.

In an unpublished study, Morse found no significant relationships between scores obtained by physician assistant trainees at the Medical College of Georgia on the Myers-Briggs Type Indicator, the Rokeach Scale and academic program success.[26]

In their review of studies done on student selection and prediction of success in occupational education, Stock and Pratzner emphasized the need to define success in terms which reach beyond cognitive abilities.[27] They separated program prediction studies into either achievement or completion oriented success criteria. They also pointed to the need for future studies to consider criteria oriented toward many aspects of occupational life.[28]

When nurse training success was defined as continuing in, or graduating from, a program, Thurston, Brunclik, and Feldhusen found significant correlations in predictor variables which included attitudinal measures.[29] Gough, Hall, and Harris questioned the value of academic success as opposed to creative professional success as a goal of physican education.

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[26]P. Kenneth Morse, Personal Communication (Augusta: The Medical College of Georgia, October, 1974).

[27]William E. Stock and Frank C. Pratzner, "Review of Research on Student Selection and the Prediction of Success in Occupational Education," The Minnesota Research Coordinating Unit in Occupational Education, ERIC Document, ED039 319, (1969), p. 34.

[28]Ibid.

[29]John R. Thurston, Helen L. Brunclik, and John F. Feldhusen, "Personality and the Prediction of Success in Nursing Education," Nursing Research 18 (1969):262.

They recommend that the traditional cognitive predictors be broadened to include tests for divergent thinking, aesthetic predisposition, independent achievement, cognitive flexibility and perceptual openness.[30]

Whether or not success is defined in terms of scholastic achievement, program completion, or psychomotor performance, a psychological battery of tests covering various aspects of personality is more likely to contribute to higher predictive accuracy than any one test.[31] This dissertation is a contribution to efforts which attempt to identify significant factors which may exist between various aspects of personality and the success criteria of competency based health occupational training programs.

Assumptions

As noted above, the prediction of success in any educational program is risky. Even after defining success criteria and carefully collecting and analyzing all of the variables, a multiple correlation coefficient as high as R=.70 accounts for less than half of the total variance. This study, therefore, began with several assumptions:

    1. Personality measures can contribute to the
         selection of candidates and will be useful

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[30]Harrison G. Gough, Wallace B. Hall, and Robert E. Harris, "Admissions Procedures as Forcasters of Performance in Medical Training," The Journal of Medical Education 38(1963):996.

[31]Eysenck, "Student Selection by Means of Psychological Tests," 33.

in predicting success in a physician
extender (MEDEX) program.

2. Selection of candidates can be improved
and admissions criteria supplemented by
personality testing.

3. Personality tests selected for this study
contain measurements important for the
successful physician extender in terms of
psychomotor performance and interpersonal
skills.

4. Predictive relationships which may be
found can be applied to other health
technologies with similar success criteria.

5. Program success is related to occupational
success.

The last assumption is probably the most tenuous. Physi-
cian extender training programs have been in existence for
less than ten years. The number of graduates is still small,
and current programs generally define curriculum objectives
based on a subjective and intuitive analysis of occupational
roles. Whatever the results of this study, they must, at some
future date, be reevaluated in terms of an emerging technology
and shifting expectations. Consequently, the success criteria
set forth in this dissertation were a combination of tradi-
tional testing of academic achievement and competency based
evaluations equated with a grade point average.

These success criteria will probably prove to be the
most flexible in the long run since: (a) the roles and tasks

of physician extenders are still evolving, and (b) the grade
point average is likely to continue in wide spread use as a
measure of educational performance.

Finally, it must be noted that the quantification of the
data collected has been accomplished with the aid of sophis-
ticated statistical techniques. The collection of data,
however, especially the success variables, were subject to
errors inherent in the fact that many individuals participated
in assessing a wide variety of skills under varying conditions.

The Hypotheses

The hypotheses tested at the .25 level of significance
were concerned with the degree of prediction associated with
scores obtained from various personality measurements,
including age, past medical and educational experiences, and
earned grade point averages in seven areas of program evalua-
tion. A general hypothesis can be stated: There is a pre-
dictive relationship between various personality measures
and earned grade point averages in seven areas of the MEDEX
program evaluation.

The specific hypotheses to be tested are:

1. There is a predictive relationship between
    various personality measures and the Uni-
    versity phase grade point average.

2. There is a predictive relationship between
    various personality measures and the pre-
    ceptor evaluation grade point average.

3. There is a predictive relationship between various personality measures and the site-visit grade point average.

4. There is a predictive relationship between various personality measures and the physical examination audit grade point average.

5. There is a predictive relationship between various personality measures and the algo-rithm audit grade point average.

6. There is a predictive relationship between various personality measures and the final examination grade point average.

7. There is a predictive relationship between various personality measures and the total adjusted grade point average.

Each hypothesis seeks to establish predictive relation-ships between measurements obtained from psychological pro-files and candidate skills acquisition as evaluated by individuals associated with the MEDEX program.

Deduced Consequences

From the correlation data generated between various personality measures and success criteria, stepwise multiple regression equations were calculated for each of the seven earned grade point averages. If certain personality factors predict success, the regression equations can be used in selecting candidates for admissions, counseling candidates

already matriculated, and defining the personality variables which may be associated with occupational success.

The equations may be applied, with some modifications, to other physician extender programs and to other types of health science programs that seek to develop similar psycho-motor and interpersonal skills.

Definition of Terms

Physician Extender

The assistant to the primary care physician is a new member of the health care delivery team. His title may be Physician's Assistant, Physician's Associate, Nurse Practi-tioner, Health Associate, Primex, or Medex. A medex is characterized as a physician extender in an interdependent role with other members of the health care team.

Emphasis in the MEDEX program[32] of extending the capa-bilities of the physician (MEDicin EXtension) is placed on the development of psychomotor and interpersonal skills to improve patient care. These skills involve the patient, physician, nurse, and other allied health personnel. The medex role is one of data collection, patient assessment, counseling, and emergency care in a joint effort with other team members.

The medex candidate enters the training program with a minimum of three years experience in primary health care

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[32]Richard A. Smith, "MEDEX," Northwest Medicine 68 (1969):1023-1030.

delivery, but with very little background in academic medicine or any formal higher education. Candidates are, typically, oriented toward achieving technical competence rather than developing a cognitive or abstract theoretical background. The training program encourages the development of manipulative skills.

Upon completion of the training program and certification by the Medical University of South Carolina, the medex is eligible to sit for the National Board examination for Assistants to Primary Care Physicians which is administered annually by the National Board of Medical Examiners.

Primary Care Physician

The primary care physician is generally consulted directly by the public and has a practice characterized by a broad scope of medical services including management of slowly progressive and chronic illness, preventive and emergency services, and personal and family counseling.[33]

Manipulative Tasks

Any physical assessment, percussion, auscultation, palpation, or observation is defined as a manipulative task.

Program Success

Success is quantified in terms of the earned grade point average as explained in Chapter II. The averages reflect an evaluation system designed to measure behavioral objectives.

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[33]Joseph L. Dorsey, "Manpower Problems in the Delivery of Primary Medical Care," The New England Journal of Medicine 282 (1970):871-872.

Nomenclature

Medex refers to the individual trained. MEDEX refers to the training program. Possessive and plural is medex and MEDEX respectively.

Clinical Algorithms

Clinical algorithms are detailed descriptions of the solutions of specific clinical problems. The algorithm defines the clinical data to be obtained for a patient's problem and describes how these data are to be used. The minimal components of the algorithm system are the algorithm, a checklist for recording the clinical data and the plans specified by the algorithm, and the method to analyze whether or not the algorithm logic was followed correctly.[34]

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[34]Richard K. Tompkins, <u>Computer-Based Paramedic Support and Audit</u>, Fourth Quarterly Project Report, Hanover, N.H., July 1974 (Hanover, N.H.: Dartmouth Medical School, 1974), p. 3.

II

METHODOLOGY

Procedures and Data Sources

Six standard psychological tests were administered to
sixty-nine candidates after matriculation, but before classes
began, between October 1972 and April 1974. Thirty of the
independent variables were measurements derived from these
tests. (See Table 1) The remaining three independent
variables listed in Table 1 were obtained from the candidate's
admissions application.

Program success was a function of six weighted factors
which were averaged to give the Adjusted Grade Point Average
(A-GPA). All of the dependent variables (See Table 2) were
calculated on the 4.00 grading system directly from the
program's behavioral objectives. The evaluation of each
candidate was directed toward a quantitative analysis of his
medical and interpersonal skill acquisition.

Evaluation during the twelve month program was divided
into two phases, the University phase and the Preceptorship
phase.

Before the candidate could enter the preceptorship phase
he was required to successfully complete the three month
University phase with an earned GPA of 2.00 or better. These
criteria included: 1) demonstrated competency in obtaining
and recording a complete medical history and physical exam-
ination, 2) demonstrated ability to use clinical algorithm
checklists correctly, 3) demonstrated ability to communicate

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TABLE 1

MEANS AND STANDARD DEVIATIONS OF
THE INDEPENDENT VARIABLES (N=67)

Variable	Mean	S.D.	Variable	Mean	S.D.
Myers-Briggs			**Rokeach Scale**		
EI	93.46	21.63	Rokch	137.21	25.43
SN	76.27	23.71			
TF	94.96	17.13	**FIRO-B**		
JP	81.03	25.29			
			EI	4.90	1.72
POI			WI	2.85	2.89
			EC	2.78	2.48
TC	16.79	3.29	WC	3.63	1.85
I	83.91	7.56	EA	4.07	2.08
SAV	20.07	2.37	WA	5.42	2.57
Ex	19.42	3.43			
Fr	15.54	2.34	**Study of Values**		
S	12.01	2.46			
Sr	12.52	1.84	Theo	43.32	6.92
Sa	16.12	2.94	Econ	41.80	6.61
Nc	12.01	1.80	Aest	37.64	7.97
Sy	7.01	1.19	Soci	40.30	6.04
A	16.46	2.69	Polt	40.55	6.25
C	18.37	2.76	Relg	37.88	7.46
I-E Scale			**Personal History**		
IE	7.85	3.89	Age	32.89	7.63
			MD Exp	9.87	7.57
			Educ	13.30	1.39

TABLE 2

MEANS AND STANDARD DEVIATIONS OF
THE DEPENDENT VARIABLES (N=67)

Variable	Mean	S.D.
U-GPA	2.49	0.45
P-GPA	3.26	0.63
S-GPA	3.02	0.60
PE-GPA	2.58	0.53
AA-GPA	2.58	0.59
F-GPA	2.51	0.50
A-GPA	2.81	0.33

A-GPA = .25(U-GPA) + .35(P-GPA) + .05(S-GPA)
+ .125(PE-GPA) + .125(AA-GPA) + .10(F-GPA)

technically and therapeutically with the doctor and the patient, 4) demonstrate appropriate levels of competence in performing manipulative tasks as outlined in behavioral terms for each course studied, and 5) a recommendation from the faculty regarding the candidate's reliability and thoroughness in his work. The University Phase Grade Point Average (U-GPA) accounted for 25 per cent of the A-GPA.

During the nine-month preceptorship program each candidate was evaluated in the remaining five areas of success criteria. The physician-preceptors quantitatively evaluated their trainee quarterly. These three scores accounted for the Preceptor Evaluation Grade Point Average (P-GPA). Since total competency should best be demonstrated in the environment that the candidate is being prepared to work, i.e., a primary health care practice, the P-GPA accounted for 35 per cent of the A-GPA.

Three visits to the physician-preceptor's practice were made during the preceptorship by a member of the University faculty. A written evaluation was made of training, utilization, and abilities in manipulative tasks and interpersonal skills. The Site-Visit Grade Point Average (S-GPA) accounted for 5 per cent of the A-GPA.

Each candidate completed two comprehensive medical history and physical examinations per month, for a total of eighteen, which were audited by the physician-preceptor and a member of the University faculty. The evaluations were based on a problem oriented medical record format developed with the University's Department of Family Practice. The grade point

average for the Physical Examination Audit (PE-GPA) accounted for 12.5 per cent of the A-GPA.

Twenty clinical algorithm checklists were completed each month by every candidate. All checklists were computer audited for significant errors of logic. Errors in logic were defined in terms of a grade point average on the 4.00 scale. A final Algorithm Audit Grade Point Average (AA-GPA) was calculated at the end of the preceptorship phase for the 180 checklists. The AA-GPA accounted for 12.5 per cent of the A-GPA.

A final examination was administered to all candidates at the end of the preceptorship phase of training. The examination was composed of: 1) a written test, 2) an audit of performance on a complete medical examination by a physician not associated with the training program, and 3) a competency oriented audit of the candidate's total performance with actor-patients by the University faculty and the actor-patients. These three scores were averaged for the Final Examination Grade Point Average (F-GPA) which accounted for 10 per cent of the A-GPA.

By April 1975, five MEDEX classes had been trained and all A-GPA's calculated to complete the dependent variables for sixty-seven medex. (See Tables 2 and 3)

Data Gathering Instruments

The psychological tests selected were the Myers-Briggs

TABLE 3

SCHEDULE OF CLASSES FOR MEDEX CANDIDATES
BETWEEN OCTOBER 1972 AND APRIL 1975

Class	n	Started	Completed
MEDEX I	17	October 1972	October 1973
MEDEX II	9	March 1973	March 1974
MEDEX III	13	June 1973	June 1974
MEDEX IV	7	November 1973	November 1974
MEDEX V	21	April 1974	April 1975

Type Indicator, Form F,[35] Shostrom's Personal Orientation
Inventory (POI),[36] Rotter's Internal Versus External Control
of Reinforcement Scale (I-E Scale),[37] The Rokeach Dogmatism
Scale, Form E,[38] Schutz's Fundamental Interpersonal Relations
Orientation-Behavior Scale (FIRO-B),[39] and Allport's Study

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[35]Isabel Briggs-Myers, The Myers-Briggs Type Indicator
(Princeton, New Jersey: Educational Testing Service,
September, 1962), pp. 1-6.

[36]Everett L. Shostrom, Personal Orientation Inventory:
An Inventory for the Measurement of Self-Actualization (San
Diego, California: Educational and Industrial Testing
Service, 1970), p. 5.

[37]Julian B. Rotter, "Generalized Expectancies for
Internal Versus External Control of Reinforcement," Psycho-
logical Monographs: General and Applied 80 (1966):1-4.

[38]Milton Rokeach, The Open and Closed Mind (New York:
Basic Books, 1960), pp. 55-56.

[39]William C. Schutz, FIRO: A Three Dimensional Theory
of Interpersonal Behavior (New York: Holt, Rinehart and
Winston, 1958), p. 3.

of Values Scale.[40]

The Myers-Briggs Type Indicator was used to implement Jung's Theory of psychological type.[41] The theory proposed that much of the apparently random variations in human be- havior was actually quite ordered and consistent and is due to some basic differences in the way people prefer to use perception and judgement.[42] The Indicator attempts to identify, from a self-report questionnaire, an individual's basic preference toward these behaviors.

The Indicator contains four separate measurements for de- termining an individual's personality in relation to percep- tion and judgement. The extravert-introvert index (EI) deter- mines whether or not one directs perception and judgement to- ward the environment or upon concepts and ideas. The sensing- intuition index (SN) measures the degree of preference for one of these two kinds of perception. The thinking-feeling index (TF) measures the degree to which an individual relies on one of these two kinds of judgement. The last index, judgement or perception (JP) is designed to measure the degree to which a person relies on a judging process or a perceptive process in ordering his dealings with the environment.[43]

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[40]Gordon W. Allport, Phillip E. Vernon, and Gardner Lindzey, Study of Values: A Scale for Measuring the Dominant Interests in Personality (New York: Houghton Mifflin,1970),p.3.

[41]Carl G. Jung, Psychological Types (London: Rutledge and Kagran Paul, 1923).

[42]Briggs-Myers, The Myers-Briggs Type Indicator, p. 51.

[43]Ibid. p. 3.

The letter is considered the most important part of the score because it indicates the type a person prefers. The numerical score shows how strongly the type is reported. The letters from all four scores with the corresponding implications, make up the type formula, such as ESTJ, which describes the person's predominant disposition or type.

Continuous scale scores and type preference range as follows:

47 E	....	100	....	I 159
33 S	....	100	....	N 151
51 T	....	100	....	F 151 (males)
39 T	....	100	....	F 149 (females)
45 J	....	100	....	P 161

On every index, then, the scores run in both directions from 100 where the reported preference changes.[44]

The POI measures the degree that a person lives a fully enriching life. Such an individual is seen as developing and utilizing all of his unique capabilities, free of limiting inhibitions and emotional turmoil. Maslow first developed the idea and called such an individual self-actualizing.[45] Shostrom developed the inventory which measures two basic scales, time competence (TC) and inner directed support (I), together with ten subscales, each measuring an important

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[44]Ibid.

[45]Abraham Maslow, Motivation and Personality (New York: Harper, 1954), p. 124.

attribute of self-actualization.[46]

The TC scale measures the degree to which a person is oriented to the present. The I scale measures whether reactivity orientation is basically toward others or self. The self-actualizing value of the subscale index (SAV) measures the affirmation of this primary value in people. The existentiality (Ex) index measures the ability to situationally or existentially react without rigid adherance to principles. The feeling reactivity index (Fr) measures sensitivity of responsiveness to one's own needs and feelings. The spontaneity index (S) measures freedom to react spontaneously, or to be oneself. The self-regard index (Sr) measures affirmation of self because of esteem in worth or strength. The self-acceptance index (Sa) measures affirmation of self in spite of weaknesses or deficiencies. The nature of man index (Nc) measures the degree of a constructive view of the nature of man, masculinity, and femininity. The synergy index (Sy) measures the ability to be synergistic and to transcend dichotomies. The acceptance of aggression index (A) measures the ability to accept one's natural aggressiveness as opposed to defensiveness, denial, or repression of aggression. The final subscale, the capacity for intimate contact index (C) measures the ability to develop close intimate relationships with other human beings, unencumbered

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[46]Shostrom, _Personal Orientation Inventory_, p. 5.

by expectations and obligations.[47]

Scores for the time and support scales are each presented as TC and I values. The possible raw score ranges and established adult normal means are 1-21; 17.70 and 52-94; 87.25 respectively. The possible raw scores range from 1-25 on the ten subscales and the established adult normal means are SAV-20.17, Ex-21.80, Fr-15.74, S-11.65, Sr-11.97, Sa-17.09, Nc-12.37, Sy-7.32, A-16.63, and C-18.10.[48] Scores smaller than the mean reflect less development toward the characteristics of a self-actualizing individual.

The Rotter I-E Scale measures whether an individual perceives reward as dependent on his own behavior or independent of it. If a person believes that personal reward is dependent upon his own behavior, or his own developing characteristics, he is said to believe in internal control. When a reinforcement is seen by a person as due to the control of other powers, or as unpredictable, he can be said to believe in external control.[49]

All test items on the I-E Scale deal with the subject's belief about the nature of the world, or how reinforcement is controlled. The score is the total number of external choices made. The higher the score, the more external are the person's perceptions about the locus of control.

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[47]Ibid. p. 6

[48]Ibid. p. 26

[49]Rotter, "Generalized Expectancies for Internal Versus External Control of Reinforcement," 1.

External and internal scores are not easily defined.
Two larger studies of students in high school and college
however, resulted in means of 8.50 and 8.29 respectively.[50]

The Rokeach Dogmatism Scale is a measure of an individual's belief system in terms of open or closed mindedness.[51]
The Scale is a self-administered instrument designed to test
that part of man's conceptualizations which deal with the
open or closed nature of belief systems. Test results give
a better understanding of the cognitive and emotional
functioning of open-minded and closed-minded persons and
relates such functioning to personality.

Higher scorers on the Dogmatism Scale are found to differ
from lower scorers in the ability to synthesize new beliefs
into a new system. The lower scorers, open-mindedness, have
the ability to remember and integrate new information. Those
with relatively closed systems approach problem solving best
when they are not required to synthesize parts of a new belief
system.[52] Higher scorers tend to resist changes in systems
of belief, have difficulty in the synthesis phase of thinking
and perceiving, are more dogmatic and are less able to integrate sets.[53]

Mean scores on the Dogmatism Scale, Form E, range from

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[50]Ibid. p. 15.

[51]Rokeach, The Open and Closed Mind, p. 5.

[52]Ibid. p. 287.

[53]Ibid. p. 289.

a high of 183.2 at a VA domiciliary and 175.8 for a group of English workers, to a low of 141.3 for a group of University students.[54]

The FIRO-B Scale measures an individuals expressed and wanted behaviors in relationships established with others. The areas measured are inclusion, control, and affection.[55] The test can assist in predicting how an individual will act in inter-personal situations.

The interpersonal dimensions of FIRO-B theory - Inclusion (I), Control (C), and Affection (A) - are defined as follows:

I - Inclusion is the need to establish and maintain a positive relationship with other people with respect to interaction and association.

C - Control is the need to establish and maintain a positive relationship with other people with respect to influence and power.

A - Affection is the need to establish and maintain a positive relationship with other people with respect to love and affection.[56]

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[54]Ibid. p. 90.

[55]William C. Schutz, The FIRO Scale Manual (Palo Alto, California: Consulting Psychological Press, 1967), p. 4.

[56]Ibid. p. 5.

The FIRO-B is made up of six scales composed of expressed (e) and wanted (w) behavior in terms of Inclusion, Control, and Affection. They are: making efforts to include others (e^I), exerting influence over others (e^C), making efforts to become friendly (e^A), wanting to be included (w^I), wanting others to influence self (w^C), and wanting others to express friendship toward self (w^A).[57]

Much information has been obtained on various groups with the FIRO-B. The differences among occupational groups have been very great and, for the most part, consistent with stereotypes. Two relevant examples are given in Table 4.

TABLE 4

FIRO-B SCORES FOR TWO GROUPS[58]

Scale	Group A means*	Group B means**
e^I	5.6	5.1
w^I	5.4	4.6
e^C	4.9	3.0
w^C	5.4	5.0
e^A	4.0	4.4
w^A	5.0	5.9

* University of California Medical School advanced students (N=39).

**University of California Medical School nurses (N=16).

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[57]Ibid.

[58]Ibid. p. 7.

The Study of Values Scale attempts to measure the relative importance of six basic interests, or motives, in personality. These include the theoretical, where the dominant interest is truth, the economic, where the main interest is in what is useful, the aesthetic, where the motivation is form and harmony. The social scale attempts to measure the dominance of altruism, the political, where interest is primarily in power, and the religious, where value is placed on totality or unity.[59] A person does not, of course, belong exclusively to one or the other of these value clusters and given scores are not independent of each other.

The test is constructed and scored to give an average value of forty for any single interest. Only the larger depressions or peaks in a profile are significant. A flat profile indicates that the individual favors all six values equally by this measurement. The literature should be consulted for discussions of scores which significantly differ from the mean.[60]

Many evaluation instruments were used to gather the information necessary to calculate the six success factors used to compute the A-GPA. Some of the more non-traditional instruments are in Appendix A.

Evaluating Performance

The University phase of the curriculum was composed of

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[59]Allport, Study of Values, pp. 4-5.

[60]Ibid. pp. 8-12.

five subjects: Medical History and Physical Diagnosis, Intro-
duction to Problem Oriented Medicine, Laboratory Medicine,
Orientation to the Allied Health Professions, and Human Rela-
tions and Interpersonal Skill Development. .

Course objectives for Medical History and Physical Diag-
nosis were evaluated by a physician grading the candidate's
progress in performing and recording the medical history and
physical examination. Weekly evaluations were completed on
a checklist citing the relevant criteria. A scale between
zero and three was used for quantifying the evaluation. The . .
grades assigned for all reports were averaged for each candi-
date.

Both didactic and clinical training evaluations were
included in an Introduction to Problem Oriented Medicine.
Multiple choice examinations were administered twice to
evaluate the comprehension of course objectives in assess-
ment and treatment aspects of common emergency, acute, and
chronic medical problems. Clinical experiences were evaluated
in writing by clinical faculty, at least weekly, in terms of
ability, skills, motivation, and attitude. Grades were as-
signed and averaged for these tests and reports.

Short multiple choice and work completion tests were the
means of evaluation in Laboratory Medicine. The scores were
assigned grades and the grades averaged for each candidate.

Evaluation scores for Orientation to the Allied Health
Professions were obtained from two sources. A multiple choice
final examination and written protocols, completed by the

candidates, on various topics in disease prevention and health maintenance counseling. Grades were assigned and averaged for each candidate.

The objectives in the Human Relations course were evaluated by examinations centered on a human relations training manual.[61] Mastery of other texts and materials presented in handouts or lectures were assessed through multiple choice examinations.[62,63]

At the end of the University phase of training, the final grades for each course were weighted, by hours per week per course, and then averaged to give the U-GPA for each candidate.

The P-GPA was an average assigned to three quarterly reports completed by the physician-preceptor. The written report consisted of quantifying abilities, skill development, motivation, attitudes, interpersonal skills, and utilization criteria. These evaluations were averaged to give the P-GPA for each candidate.

University faculty evaluated the preceptorship training experience during site-visits on a written report attempting to quantify the educational appropriateness of the practice

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[61]Granville L. Sydnor, Robert L. Akridge, and Nadine L. Parkhill, Human Relations Training: A Programmed Manual (Louisiana: Human Resources Development Training Institute, 1972).

[62]Bennett Olshaker, What Shall We Tell The Kids? (New York: Dell Publishing Co., Inc., 1971).

[63]Leonard Campos and Paul McCormick, Introduce Yourself to Transactional Analysis (Stocton, California: San Joaquin TA Institute, 1972).

and other criteria designed to measure the candidate's progress. Assigned grades were averaged to give the S-GPA for each candidate.

The completed medical examinations audited during the preceptorship were evaluated on the checklists used during the University phase. A final averages gave the PE-GPA.

Clinical algorithm checklists were audited for errors of logic through the computer facilities at the Dartmouth Medical School.[64] Monthly progress was charted and a final grade was assigned to give each candidate the AA-GPA.

The written test on the final examination consisted of multiple choice and work completion questions on common medical findings in health and disease. The audit of performance on the complete medical examination utilized the same checklists used in the University phase of training. An audit of general competency on simulated patients was accomplished using checklists oriented toward algorithm logic and interpersonal skills. The total points earned for the examination were calculated and a grade assigned for each candidate for the F-GPA.

All evaluation measurements and criteria remained essentially unchanged for the entire period of the study. Individual variations in faculty expectations or physician interests cannot, of course, be controlled to any precise degree. These differences must be kept in mind when evaluating the findings

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[64]Tompkins, Computer-Based Paramedic Support and Audit, p. 5.

of this study. Table 2 lists the means and standard deviations of these variables.

Statistical Techniques

An approach highly complementary to the longitudinal and multi-variable measurement problem reflected in the previously described Procedures is the multiple regression approach to evaluative research.[65] Assuming uniform data collection techniques for individuals analyzed and using the multiple regression approach it is possible to evaluate the data by: a) incorporating classes of MEDEX candidates within a longitudinal span across blocks of classes (MEDEX I - V) - controlling for time; b) working within one particular class, if desired - controlling for specified concommitant variables; c) testing the significance of independent variables as additive units; d) testing the significance of independent variables as interacting linear units; e) testing the significance of independent variables as curvilinear units; and f) identifying the least number of independent variables needed to predict the various GPA's.[66]

It is possible to predict individual scores from different classes by multiple linear regression analysis. A single dependent variable can be estimated from several independent

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[65]See, for example, Francis J. Kelly, Donald T. Beggs, and Keith A. McNeil, Research Design in the Behavioral Sciences: Multiple Regression Approach (Carbondale, Illinois: Southern Illinois University Press, 1969).

[66]Ralph F. Catalanello, Kent A. Mingo, and George E. Pinches, "Evaluative Research Design for the Health Manpower Innovation," Social Science and Medicine 6(1972):235.

variables and the residual error of the estimate can be
calculated when a multiple regression equation is used.

The general form of the prediction equation is:

$$\hat{Y}_i = b_0 + b_1 X_{i1} + b_2 X_{i2} + b_3 X_{i3} \ldots b_p X_{ip}, \quad i = 1, 2, \ldots, n$$

where: X_{ij} is the reading on the jth variable for the ith
individual, b_0 is a constant term, b_j, where $j = 1$,
$\ldots$, p is a number computed from the data indicating
the weight given to X_{ij} in the regression equation.
It is called a partial regression coefficient. $\hat{Y}_i$
is the predicted value of Y_i, the observed value of
the dependent variable. n is the number of indivi-
duals and p is the number of independent variables.

The justification and rationale for the computation of
the predictive equation given above is described in detail
in many standard statistical texts.[67]

The multiple regression equation for the prediction of
GPA's of medex candidates was organized as follows:

The independent variables (see Table 1), X_1 = Rotter
I-E score, X_2 = Rokeach score, $\ldots X_{33}$ = Age of indi-
vidual, were used with each of the dependent vari-
ables (see Table 2) such as Y_1 = U-GPA$\ldots Y_n$ = A-GPA.
The partial regression coefficients b_1, $b_2, \ldots b_{33}$,
for the corresponding X_j in each equation were
calculated. The constant, b_0, was also computed
from the data for each equation.

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[67]For example, see: Helen M. Walker and Joseph Lev,
Statistical Inference (New York: Holt, Rinehart, and Winston,
1953), pp. 319-321.

The prediction equations obtained with the data collec-
ted for this dissertation involve a large number of terms
and much computation. Two obvious questions about the effec-
tiveness of prediction must, therefore, be considered:
1) How effective are the equations in estimating the various
GPA's for the population of medex candidates, and 2) If the
equations were applied to another class, how effective would
the predictions be?

If there is a high correlation between the observed
scores, Y_i, and the independent variables, X_j, the regression
equation is a satisfactory predictor for the group GPA's.
This coefficient of correlation is called the multiple
correlation coefficient. For the variables listed in Table
2 these are the correlations between Y and the X's.[68]
The symbol for this multiple correlation is $R_y(12....n)$.
The primary subscript to the left of the parenthesis names
the dependent variable. The secondary subscripts in paren-
thesis name the independent variables used as predictors in
the regression equation. The multiple correlation coeffi-
cient will be written R when each equation is discussed.

A measure of the effectiveness of prediction for the
observed group may be obtained by partitioning the total sum
of squares (TSS) of Y_1 into the sum of squares due to error
(SSE) and the sum of squares due to regression (SSR).[69]

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[68]Ibid. p. 321.

[69]Ibid. p. 320-322.

The ratio $\frac{SSR}{TSS}$ is $R^2y(12....n)$ or simply R^2, which represents that proportion of the sum of squares of the dependent variables which can be ascribed to variations in the independent variables. Thus $1-R^2y(12....n)$ or simply $1-R^2$ is that proportion of variation in the dependent variables which is independent of the variations in the predicting variables and so must be attributed to other sources of variation.

The question of how effective the regression equation is in prediction may only be answered in terms of a value judgement based on how much unexplained variation can be tolerated in a given situation. This depends, in part, on whether or not the reduction in unexplained variation, R^2, represents an increase of information sufficient to justify the expenditure of money and time required to generate the equation. As the value of R^2 increases, however, these expenditures become easier to justify.

The regression equation may be useful with new groups of candidates if an appropriate sample number supports the justified value of the multiple correlation coefficient and the values of the variables for the new group are within the range of values of the variables for the old group. The previously mentioned partition of the sum of squares provides a test of significance for the multiple correlation coefficient.[70] A number can be computed from this information and compared with a tabled F value at an assigned level of signi-

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[70]Ibid. pp. 323-324.

ficance. The hypotheses of predictability can then be
accepted or rejected. The computer F statistic is:

$$F = \frac{R^2}{1-R^2} \cdot \frac{N-P}{P}$$

where P = the number of predictor variables and N = the
sample size. This F has P degrees of freedom in the numera-
tor and N-P in the denominator. As N increases the signifi-
cant value of F distribution decreases and the computed equa-
tion will provide a greater degree of certainty in explaining
the variations of predicted success.

The Stepwise Regression Computer Program, BMD-02R, de-
veloped by the Department of Biomathematics at the University
of California was used to statistically evaluate the inde-
pendent variables given in Table 1.[71]

BMD 02R computed the multiple correlation coefficient.
Variables were added, stepwise, according to which had the
largest F statistic at that stage. A regression equation
was computed at each step for the dependent variables of
interest (Y). This was composed of the independent variable
(X_j), regression coefficients (b_j) and their standard errors,
and constant (b_o). When the largest F to enter was not sig-
nificant at the .25 significance level only the variables
included up to that stage were used in the prediction

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[71]Biomedical Computer Programs (Los Angeles: University
of California Press (1973), p. 305.

equation.[72] The program, however, printed all steps where
the F to enter exceeded a value of .01.

The program also provided a Summary Table (Tables 6, 9,
12, 15, 18, 21, 24) for the analysis of independent variables
for each dependent variable at each step. This table included
the step number (column 1), variable entered (column 2),
multiple correlation coefficient (column 3), the square of
the multiple correlation coefficient, R^2, (column 4), the net
increase in R^2 (column 5), and the F value to enter the vari-
able in the equation (column 6). A plot of residuals for
each GPA was also printed. These tables (7, 10, 13, 16, 19,
22, 24) show the difference between the actual and predicted
Y. The horizontal X axis represents the predicted Y values,
$\hat{Y}$, of each candidate. The vertical Y axis represents the
difference between the observed and predicted Y value. If
each plot is not skewed in any direction and the residuals
are generally the same for high, middle, and low Y values,
then the prediction equation does not show a bias for grades
or other unknown factors.

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[72]The significance level chosen was .25 in order to
insure against the exclusion of any important independent
variable. The F statistic has P-1 and N-P degrees of free-
dom, where P is the number of independent variables and N
the number of individuals in the population. The tabled F
for 32 and 34 degrees of freedom was approximately 1.28.
Roger E. Kirk, Experimental Design: Procedures for the
Behavioral Sciences, (Belmont, California: Brooks/Cole
Publishing, 1968), p. 527.

PRESENTATION AND ANALYSIS
OF EVIDENCE

The Variables

The means and standard deviations for the independent variables of the 67 candidates who completed the program are given in Table 1 (page 17). The successful trainee was 33 years old (S.D. 7.63), had ten years medical experience (S.D. 7.57), and had completed just over 13 years of formal education (S.D. 1.39).

In terms of the Myers-Briggs Type Indicator scores, the average candidate is type ESTJ; an extravert, with a sensing perception, a thinking kind of judgement, and relying on judgement oriented processes in dealing with his environment. Extraverts direct their attention to people, objects, and events in the material world. They behave in a sociable, outer-directed, action-oriented way toward life and tend to have many interests. Extraverts are estimated to outnumber introverts in the general population of three to one. Individuals whose awareness is developed primarily through sensing rather than intuition prefer to see, touch, hear, and experience in concrete and tangible terms. They have a greater capacity for working out details. These people are probably natural patient care people.[73] It is estimated that there are

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[73]Mary H. McCaulley, and Margaret K. Morgan, Selection of Health Manpower: One Possible Solution (Gainesville, Florida: University of Florida Press, 1973), p. 48.

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about three sensing types in the general population for each
intuitive type. People who prefer thinking try to be imper-
sonal, objective, and logical. They gravitate into occupa-
tions where technical skills are needed. People who develop
a judging type prefer that their outer life be planned,
settled, and decided. They tend to be systematic and organ-
ized in their approach to life.[74]

In a twelve year follow-up study of 4272 physicians who
took the Myers-Briggs Type Indicator in their first year of
medical school, Myers and Davis reported that general
(primary care) physicians were ESTJ types at the .001 signi-
ficance level when compared with other medical specialties.[75]
McCaulley tested physician assistant students and found that
59.8 per cent (N=102), were SJ types.[76]

Myers reported that N and I types have a preference
associated with scholastic potential, P types are found in
creative people, and J types prefer vocational interests.[77]

All mean scores on Shostrom's Personal Orientation Inven-

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[74]Ibid. p. 49.

[75]Isabel B. Myers and Junius A. Davis, "Relation of
Medical Students Psychological Type to Their Specialties
Twelve Years Later," Research Memorandum (Princeton, N.J.:
Educational Testing SErvice, 1964), p. 10.

[76]Mary H. McCaulley, "The Myers-Briggs Type Indicator
and Health Occupations Education," Cognitive and Affective
Dimensions in Health Related Education (Gainesville, Florida:
University of Florida, 1974), p. 94.

[77]Briggs-Myers. The Myers-Briggs Type Indicator, p. 13.

tory are within the defined normal limits.[78] A profile
similar to medex has been reported for a group of nurses
beginning their training.[79] The only remarkable score is the
mean value of Existentiality (Ex). This single low mean score
implies that the medex candidates, as a group, tend to hold
values so rigidly that they may become compulsive or dogmatic.
This value, however, is only partially supported by the mean
score recorded on the Rokeach Dogmatism Scale. As a group,
the values of the candidates on all scales are not those of
self-actualizing individuals.

The mean score of Rotter's I-E Scale suggests that medex
candidates have a strong belief that they are in control of
their own destiny.[80] They are: a) more alert to those
aspects of the environment which provide useful information
for future behavior; b) ready to improve their environmental
condition; c) likely to place greater value on skill or
achievement objectives; and d) resistive to subtle attempts
of influence.[81]

The average candidate is not as dogmatic as the groups
previously mentioned on the Rokeach Dogmatism Scale. As a
group, however, these candidates scored higher than candidates

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[78]For a detailed analysis of the Personal Orientation
Inventory, see: Shostrom, _Personal Orientation Inventory_, p. 26.

[79]Ibid. p. 11.

[80]Rotter, _Generalized Expectancies For Internal Versus
External Control of Reinforcement_, p. 26.

[81]Ibid. p. 25.

at the MEDEX program at the University of Washington
($\bar{x}$=125.9, S.D. 21.90, N=18),[82] P.A. students at Yale
($\bar{x}$=126.9, S.D. 27.96, N=14),[83] and a group of fourth year
medical students ($\bar{x}$=126, S.D. 15.9).[84] Thus, when looking
at the results compared to similar groups, these candidates
tend more toward closed-mindedness.

The need to express or want certain kinds of behavior
was measured by Schutz's Fundamental Interpersonal Relations
Orientation Scale (FIRO-B). As a group, candidates make an
effort to belong (EI), prefer to be influenced by others (WC),
and show a strong need for others to express friendship,
love, and affection (WA). The low overall score (the sum of
Es + Ws; 23.65), is typical of adults in work which does not
require a great deal of contact with other people, such as
architects and physics majors.[85] The total scores within all
three interpersonal areas are very similar to the nursing
students previously mentioned (page 27); low scores in the
areas of Inclusion and Control but a very high score in the
Affection area.

The description of the candidates becomes clearer when
the results are viewed in terms of initiating or receiving

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[82]Judy L. DeMers, Personal Communication (Seattle: The
University of Washington, April 1974).

[83]Heikkinen, "Open-Closed-Mindedness," 1015.

[84]Eric H. Marcus, "Dogmatism and the Medical Profession,"
The Journal of Nervous and Mental Disorders 138(1964):114.

[85]Schutz, The FIRO-B Scale Manual, p. 7.

behavior. Medex not only do not prefer Inclusion and Control interaction, but when they do interact with others, they want to be the initiators.[86] The only group with a reported higher overall desire to initiate interaction is architects; even salesmen and teachers do not score as high.[87]

Average group scores measuring the prominence of six basic interests by Allport's study of Values do not identify any high or low scores. Since 40 is the average score for any single value the medex profile is nearly flat. There is, however, a slight preference for the Theoretical (43.32), and less than average interest in Religious (37.88), and Aesthetic (37.64), values. These scores are similar in direction to those obtained from medical students.[88] The medex then, values truth and aims at order and a systematic approach to life slightly more than the average person. He generally does not have much interest in the form and harmony of Aesthetic values or the unity and mysticism of Religious values.

The means and standard deviations for the dependent variables of the 67 candidates are given in Table 2 (page 17).

The preceptor evaluation gave the highest group mean GPA at 3.26. This value contributed the most when the total adjusted GPA was calculated. The mean scores on the algorithm

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[86]This is indicated by their high d scores. d=differences within need areas (e-w), and overall differences (sum of e-w; -0.15), Ibid.

[87]Ibid.

[88]Allport, Study of Values, p. 14.

audit (AA-GPA), and the physical examination audit (PE-GPA), were identical. The lowest GPA value was earned by the group for work done in the University, academic setting and the second lowest value was earned from the final examination at the University. The total GPA, when properly weighted, resulted in a mean value of 2.81, which means that the average trainee completed the program with a B- grade. The A-GPA would not have been as high had the component values not been weighted in favor of on-the-job training and evaluation.

The Prediction Equations

The analysis of the U-GPA prediction equation is given in Table 5. Eight personality measures and education were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a U-GPA is:

U-GPA = -0.09128 + (0.12325)ED value + (-0.00319)EI score + (-0.04871)C score + (0.04189)EC score + (-0.00919) Theo score + (-0.02203)Econ score + (0.00955)Aest score + (0.02415)I score + (0.00699)Rokch score.

Table 6 summarizes the relative importance of each independent variable in the U-GPA prediction equation. The weighted ED value representing years of formal education completed had an R of 0.3778. The R^2 value, 0.1427, represents the per cent, 14, of the U-GPA accounted for by the weighted ED value. The Rokeach score increased R to 0.4744, which represents an increase in the accuracy of the prediction by eight per cent (the increase in R^2). Other significant personality measures which contributed to the accuracy of the

TABLE 5

PREDICTION EQUATION FOR U-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant = -0.09128)			
ED	0.12325	0.03449	12.7689
EI	-0.00319	0.00233	1.8803
C	-0.04871	0.02131	5.2250
EC	0.04189	0.01826	5.2628
Theo	-0.00919	0.00702	1.7140
Econ	-0.02203	0.00740	8.8644
Aest	0.00955	0.00643	2.2066
I	0.02415	0.00756	10.1936
Rokch	0.00699	0.00188	13.7808

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	9	6.088	0.676	5.365
Residual	57	7.186	0.126	

TABLE 6

U-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1	ED	0.3778	0.1427	0.1427	10.8228
2	Rokch	0.4744	0.2250	0.0823	6.7953
3	Econ	0.5242	0.2747	0.0497	4.3190
4	I	0.5627	0.3167	0.0419	3.8054
5	C	0.6038	0.3646	0.0479	4.6019
6	EC	0.6340	0.4020	0.0373	3.7472
7	Theo	0.6549	0.4289	0.0269	2.7817
8	Aest	0.6639	0.4408	0.0119	1.2307
9	EI	0.6772	0.4586	0.0179	1.8803

prediction were the Economic, Theoretic, and Aesthetic scores of the Study of Values scale, the inner directed support scale (I), and the subscale measuring the capacity for intimate contact (C), of the Personal Orientation Inventory and, the expressed inclusion (EI) score and expressed control (EC) score of the FIRO-B.

The plot of residuals for the U-GPA is given in Table 7. The residuals, predicted minus observed values of the GPA, show similar positive and negative variations across the spectrum of grade averages. Errors in the estimates range from 0.62 to -0.89.

The analysis of the P-GPA prediction equation is given in Table 8. Thirteen personality measures and education were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a P-GPA is:

P-GPA = 0.75965 + (0.08654)ED value + (-0.00585)SN score + (0.00848)TF score + (-0.00514)JP score + (0.03433)S score + (0.06824)Sa score + (0.12393)Sy score + (-0.15694)EI score + (0.03782)WI score + (-0.05618)EC score + (0.05495)WC score + (0.03335)EA score + (0.01768)Econ score + (-0.0350)TC score.

Table 9 summarizes the relative importance of each independent variable in the P-GPA prediction equation. The weighted scores of self-acceptance (Sa), wanting to be controlled (WC), and judgement-perception (JP), represents 24 per cent of the P-GPA accounted for by personality measures. The fourteen significant variables including education (ED) resulted in an R = 0.7271.

TABLE 7

PLOT OF RESIDUALS FOR THE U-GPA

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          1.829      2.099      2.368      2.637      2.907      3.176
             1.964      2.233      2.503      2.772      3.041
       ............................................................
-0.90.                                        1
      .
      .                                                1
-0.74.
      .
      .
-0.59.                               1
      .
      .                           1
-0.43.                          1       11
      .                              1
      . 1            1        1
-0.28.                   11            12
      .                     1
      .                  1        11
-0.12.                  1     1
      .               1    1     1
      .           1     1     1
      .               1              1
 0.03.        1
      .                          2     1
      .                   1     1          1 1
      .       11      1          1 1      1  1
 0.19.            1       1      2 2         1
      .         1              1
      .                            1
      .         1              1           1
 0.34.              1
      .           1
      .                             1
 0.50.                        1         1
      .                 1
      .          1                        1
       ............................................................
          1.829      2.099      2.368      2.637      2.907      3.176
             1.964      2.233      2.503      2.772      3.041
```
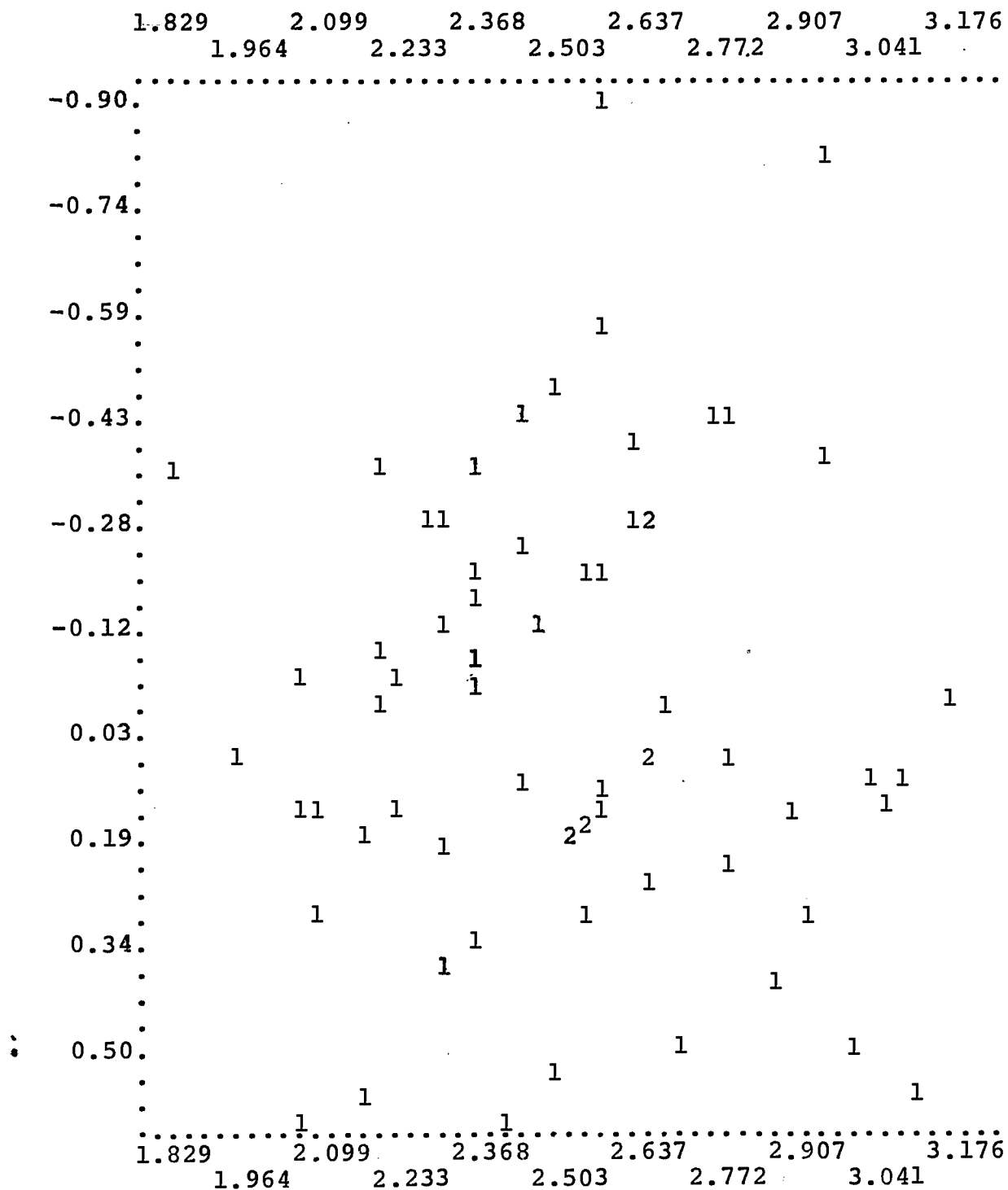
TABLE 8

PREDICTION EQUATION FOR P-GPA

Variable	Coefficient	Std. Error.	F to Remove
(Constant = 0.75965)			
ED	0.08654	0.04826	3.2153
SN	-0.00585	0.00342	2.9241
TF	0.00848	0.00411	4.2595
JP	-0.00514	0.00294	3.0633
S	0.03433	0.03040	1.2754
Sa	0.06824	0.02635	6.7064
Sy	0.12393	0.06449	3.6924
EI	-0.15694	0.04942	10.0826
WI	0.03782	0.03199	1.3982
EC	-0.05618	0.02893	3.7696
WC	0.05495	0.03987	1.8997
EA	0.03335	0.03546	0.8846
Econ	0.01768	0.01104	2.5632
TC	-0.07350	0.02842	6.6894

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	14	13.685	0.978	4.167
Residual	52	12.199	0.235	

TABLE 9

P-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1	Sa	0.2832	0.0802	0.0802	5.6694
2	WC	0.4173	0.1741	0.0939	7.2769
3	JP	0.4951	0.2451	0.0710	5.9251
4	EI	0.5312	0.2822	0.0371	3.2026
5	Econ	0.5674	0.3219	0.0398	3.5763
6	ED	0.5981	0.3577	0.0358	3.3471
7	TF	0.6367	0.4054	0.0476	4.7268
8	EA	0.6554	0.4296	0.0242	2.4621
9	TC	0.6664	0.4441	0.0145	1.4853
10	EC	0.6826	0.4659	0.0219	2.2929
11	Sy	0.6951	0.4831	0.0172	1.8285
12	SN	0.7077	0.5008	0.0177	1.9112
13	WI	0.7191	0.5172	0.0163	1.7945
14	S	0.7271	0.5287	0.0116	1.2754

The plot of residuals for the P-GPA is given in Table 10. These residuals also show similar positive and negative variations across the spectrum of grade averages. Errors of estimates range from 0.86 to -0.96. Higher predicted grade point averages, those above 3.5, are predicted with greater accuracy ranging from 0.47 to -0.64. Lower predicted averages show a wider range of errors. The P-GPA prediction equation seems, therefore, best suited to predict the excellent candidate in this area of assessment.

TABLE 10

PLOT OF RESIDUALS FOR THE P-GPA

```
        2.023        2.494        2.966        3.437        3.909        4.380
            2.259        2.730        3.202        3.673        4.144
        ...........................................................................
 -0.96.               1                    1
      .
      .                          1
      .
 -0.77.
      .
      .                                1                    1
      .
 -0.59.
      .                                              1           1 1
      .                          1                       1 1
      .                          1                 1            1
 -0.40.                                          2
      .                   1 1               11
      .                 1                    1
 -0.21.                                     1            2        1              1
      .              1                  2               1
      .                      1                1
 -0.03.1
      .                                                          1
      .                                            1        1
 0.16.                        1                1       1  1 1       1
      .                 1                   1      1   1      1  2 1
      .               1                        1          1
 0.34.                            1               1
      .                      1             1
      .                   1                              1 1
      .                 1            1   1            2
 0.53.                                             1          21
      .                                        1
      .               1                         1
 0.71.
      .
      .                                     1
      .                                   1
        ...........................................................................
      ' 2.023        2.494        2.966        3.437        3.909        4.380
            2.259        2.730        3.202        3.673        4.144
```
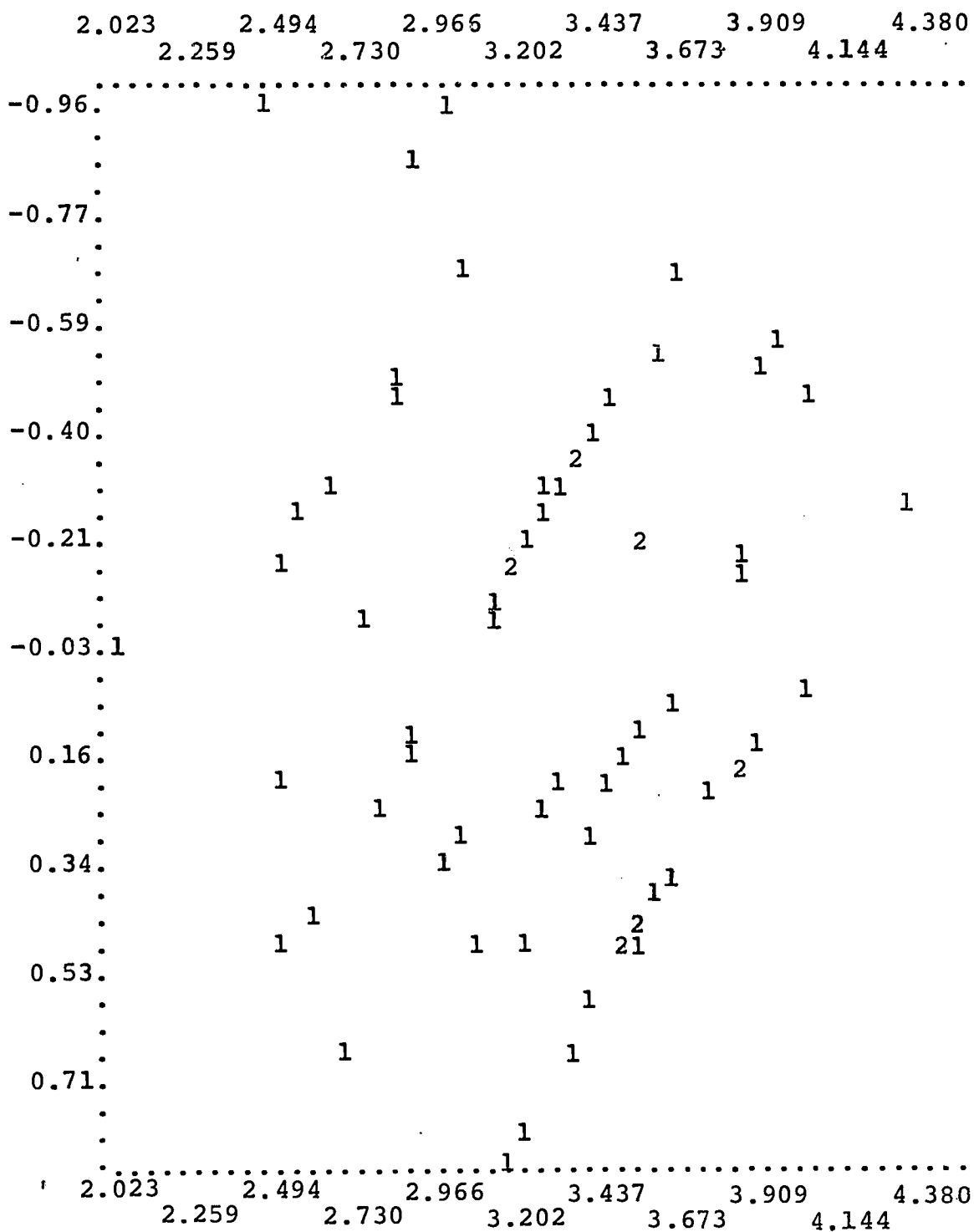
The analysis of the S-GPA prediction equation is given in Table 11. Fourteen personality measures and amount of medical experience were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a S-GPA is: S-GPA = 1.94799 + (0.01669)years medical experienc₂ + (-0.00838)SN score + (0.00648)TF score + (0.00529)JP score + (0.03634)S score + (0.04472)NC score + (0.09461)Sy score + (0.04299)A score + (-0.07450)C score + (0.07874)WI score + (-0.10881)EA score + (0.01091)Aest score + (0.01710)Soci score + (-0.02444)Relg score + (-0.00316) · Rokch score.

TABLE 11

PREDICTION EQUATION FOR S-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant = 1.94799)			
MD EXP	0.01669	0.01041	2.5731
SN	-0.00838	0.00346	5.8563
TF	0.00648	0.00440	2.1736
JP	0.00529	0.00346	2.3383
S	0.03634	0.03332	1.1893
Nc	0.04472	0.04335	1.0642
Sy	0.09461	0.07399	1.6351
A	0.04299	0.03113	1.9067
C	-0.07450	0.03290	5.1281
WI	0.07874	0.02824	7.7734
EA	-0.10881	0.03956	7.5650
Aest	0.01091	0.00926	1.3878
Soci	0.01710	0.01198	2.0364
Relg	-0.02444	0.01160	4.4433
Rokch	-0.00316	0.00275	1.3235

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	15	9.366	0.624	2.234
Residual	51	14.257	0.280	

Table 12 summarizes the relative importance of each independent variable in the S-GPA prediction equation. The first four steps accounted for 19 per cent of the predictability; the constructive view of the nature of man (Nc), 7 per cent, wanting to be included (WI), 5 per cent, thinking-feeling type preference (TF), 4 per cent, and expressing affection (EA), 3 per cent. All other variables, including previous medical experience (MD Exp), through step number 15 were significant, but none contributed more than about 2 per cent toward the prediction.

Table 13 gives the plot of residuals for the S-GPA. Errors of estimates range from 0.93 to -1.00. The residuals however, show similar positive and negative variations across the GPA spectrum.

TABLE 12

S-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1	Nc	0.2679	0.0718	0.0718	5.0272
2	WI	0.3435	0.1180	0.0462	3.3504
3	TF	0.3978	0.1582	0.0403	3.0149
4	EA	0.4310	0.1858	0.0275	2.0969
5	Relg	0.4557	0.2077	0.0219	1.6858
6	MD Exp	0.4725	0.2232	0.0156	1.2022
7	S	0.4899	0.2400	0.0168	1.3045
8	SN	0.5126	0.2628	0.0227	1.7895
9	JP	0.5352	0.2865	0.0237	1.8922
10	C	0.5531	0.3060	0.0195	1.5719
11	A	0.5739	0.3293	0.0233	1.9144
12	Sy	0.5881	0.3459	0.0166	1.3681
13	Soci	0.6023	0.3628	0.0169	1.4060
14	Aest	0.6171	0.3808	0.0180	1.5142
15	Rokch	0.6297	0.3965	0.0157	1.3235

TABLE 13

PLOT OF RESIDUALS FOR THE S-GPA
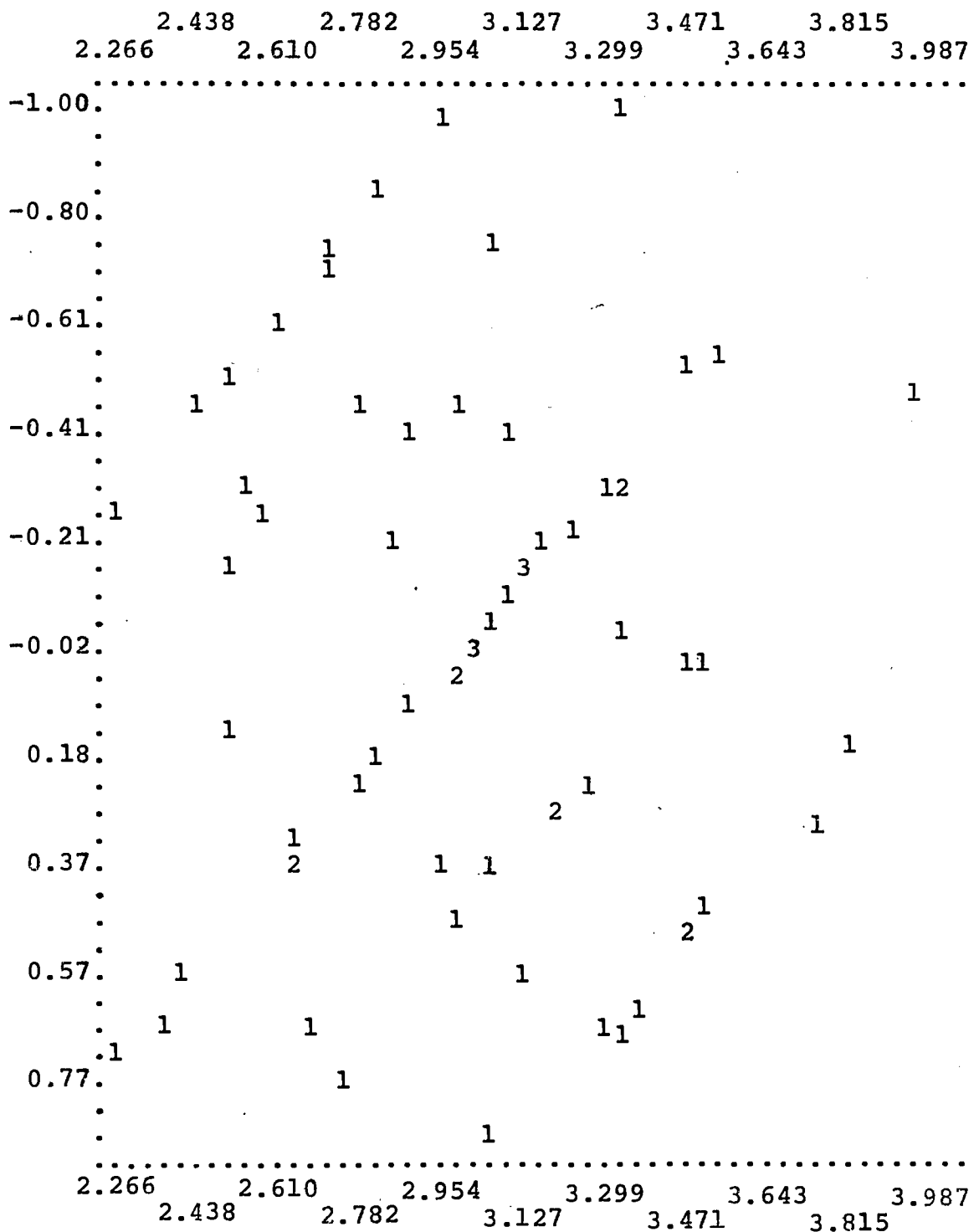
The analysis of the PE-GPA prediction equation is given in Table 14. Twelve personality measures were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a PE-GPA is: PE-GPA = -0.4444 + (0.01017)TF score + (-0.02652)Ex score + (0.04587) S score + (0.09731)Sr score + (-0.06042)Nc score + (0.06450) A score + (-0.05511)C score + (0.04270)IE score + (0.04852) EI score + (-0.08558)WA score + (0.02030)Theo score + (0.01320)Aest score.

TABLE 14

PREDICTION EQUATION FOR PE-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant = -0.4444)			
TF	0.01017	0.00374	7.3944
Ex	-0.02652	0.02109	1.5806
S	0.04587	0.02879	2.5382
Sr	0.09731	0.04127	5.5611
Nc	-0.06042	0.03184	3.6000
A	0.06450	0.02610	6.1064
C	-0.05511	0.03119	3.1212
IE	0.04270	0.01726	6.1171
EI	0.04852	0.03564	1.8540
WA	-0.08558	0.02508	11.6461
Theo	0.02030	0.00921	4.8630
Aest	0.01320	0.00732	3.2475

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	13	8.163	0.628	3.186
Residual	52	10.445	0.197	

Table 15 summarizes the relative importance of each independent variable in the PE-GPA prediction equation. The weighted wanted affection (WA) score accounted for 6 per cent and the spontaneity index (S), 8 per cent of the prediction. Six of the twelve significant predictors are scores from the Personal Orientation Inventory.

Table 16 gives the plot of residuals for the PE-GPA. Errors of estimate range from 0.95 to -0.83. The residuals show equal positive and negative variations across the spectrum of predicted averages.

TABLE 15

PE-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1	WA	0.2475	0.0612	0.0612	4.2408
2	S	0.3819	0.1459	0.0846	6.3398
3	EI	0.4179	0.1747	0.0288	2.1985
4	TF	0.4500	0.2025	0.0278	2.1617
5	Theo	0.4900	0.2401	0.0376	3.0178
6	Nc	0.5168	0.2670	0.0270	2.2078
7	C	0.5359	0.2872	0.0201	1.6658
8	IE	0.5603	0.3139	0.0268	2.2625
9	A	0.5813	0.3379	0.0240	2.0646
10	Sr	0.6172	0.3809	0.0430	3.8924
11	Aest	0.6404	0.4101	0.0291	2.7168
12	Ex	0.6533	0.4269	0.0168	1.5806

TABLE 16

PLOT OF RESIDUALS FOR THE PE-GPA

```
        1.752        2.066        2.380        2.693       ·3.007        3.321
            1.909        2.223        2.537        2.850        3.164
        ...................................................................
 -0.83.                         1                              1
     .
     .
     .
 -0.64.                                         1         1
     .
     .                                     1       1
     .                       1                 1                   1
 -0.45.                                             1
     .            1                                              1
     .                                      1     1        1
     .                  1                1  1   1  1    1                      1
 -0.26.1                                 1
     .                                          1
     .                                 1              1               1
     .                                      1    2
 -0.06.                                1
     .                                              1
     .            1              1   1 1        11        1       1
     .                               1       1       2   1    1 1 1
 0.13.                                                 1          1
     .                               1    1                       2
     .        1                                                    1
     .            1 1
 0.32.                                          1 2
     .       1                             1   1              1
 0.51.                                                    1  1 1
     .    1                                  1       1   1
 0.70.                       1                 1
     .
     .
 0.89.                                           1
     .
     .
     .                            1
        ...................................................................
        1.752        2.066        2.380        2.693        3.007        3.321
            1.909        2.223        2.537        2.850        3.164
```
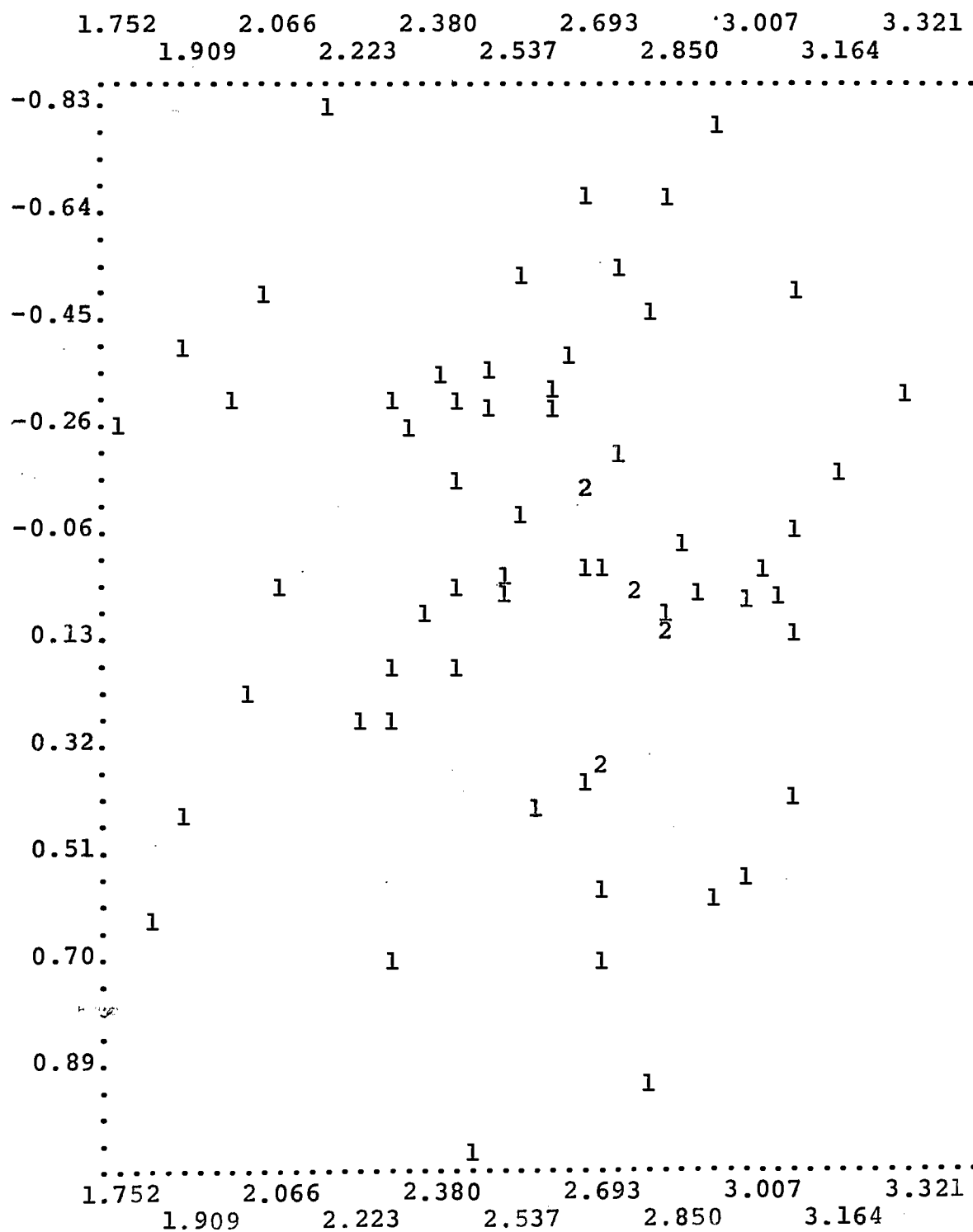
The analysis of the AA-GPA prediction equation is given in Table 17. Seven personality measures and education were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a AA-GPA is:

AA-GPA = 0.71010 + (-0.05338)years education + (0.07890) S score + (0.06255)Sr score + (-0.02077)IE score + (0.06653) WC score + (0.01773)Soci score + (0.02917)Polt score + (-0.06691)TC score.

TABLE 17

PREDICTION EQUATION FOR AA-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant =	0.71010)		
ED	-0.05338	0.04789	1.2426
S	0.07890	0.03214	6.0262
Sr	0.06255	0.05089	1.511
IE	-0.02077	0.01954	1.1307
WC	0.06653	0.03990	2.7797
Soci	0.01773	0.01135	2.4387
Polt	0.02917	0.01121	6.7768
TC	-0.06691	0.02402	7.7119

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	8	7.165	0.896	3.224
Residual	58	16.112	0.278	

Table 18 summarizes the relative importance of each independent variable in the AA-GPA prediction equation. The first five variables accounted for 27 per cent of the average. The spontaneity index (S), of the Personal Orientation Inventory accounted for 6 per cent. Years education (ED), and the time competence index (TC), both contributed about 8 per cent toward the AA-GPA.

TABLE 18

AA-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increased in R^2	F Value to Enter
1	ED	0.2056	0.0423	0.0423	2.8678
2	TC	0.2883	0.0831	0.0408	2.8506
3	S	0.3849	0.1481	0.0650	4.8108
4	Polt.	0.4420	0.1954	0.0472	3.6386
5	IE	0.4938	0.2439	0.0485	3.9137
6	Soci	0.5190	0.2694	0.0255	2.0970
7	WC	0.5383	0.2898	0.0204	1.6913
8	Sr	0.5548	0.3078	0.0180	1.5111

Table 19 gives the plot of residuals for the AA-GPA. Positive and negative residuals are similarly scattered across the spectrum of averages and range from 0.96 to -1.22.

TABLE 19

PLOT OF RESIDUALS FOR THE AA-GPA

```
        1.885        2.184        2.484        2.783        3.082        3.382
             2.035        2.332        2.633        2.933        3.232
        .................................................................
-1.22.
      .
      .
      .
-0.99.
      .                                        1
      .                                      1
-0.76.
      .              1                                          1
      .            1                    1         1
-0.52.                                       3                      1
      .                    1         2                      1
      .                 1
-0.29.                3                               1 1
      .                  11      1          1              1
      .           1 1          1             1
-0.05.          1                                          1  1
      .        1                                       1    2
      .             1                                 11
0.18. .1
      .
      .                 1                     1 1
      .              1                      1
0.41.          1                      2   2    1                      1
      .      1                            1
      .             1              1                    11  1
      .           1
0.65.                   11                        1
      .                                         11
      .                                        1
0.88.
      .
      .                                     1
      .
        ....................1............................................
        1.885        2.184        2.484        2.783        3.082        3.382
             2.035        2.334        2.633        2.933        3.232
```
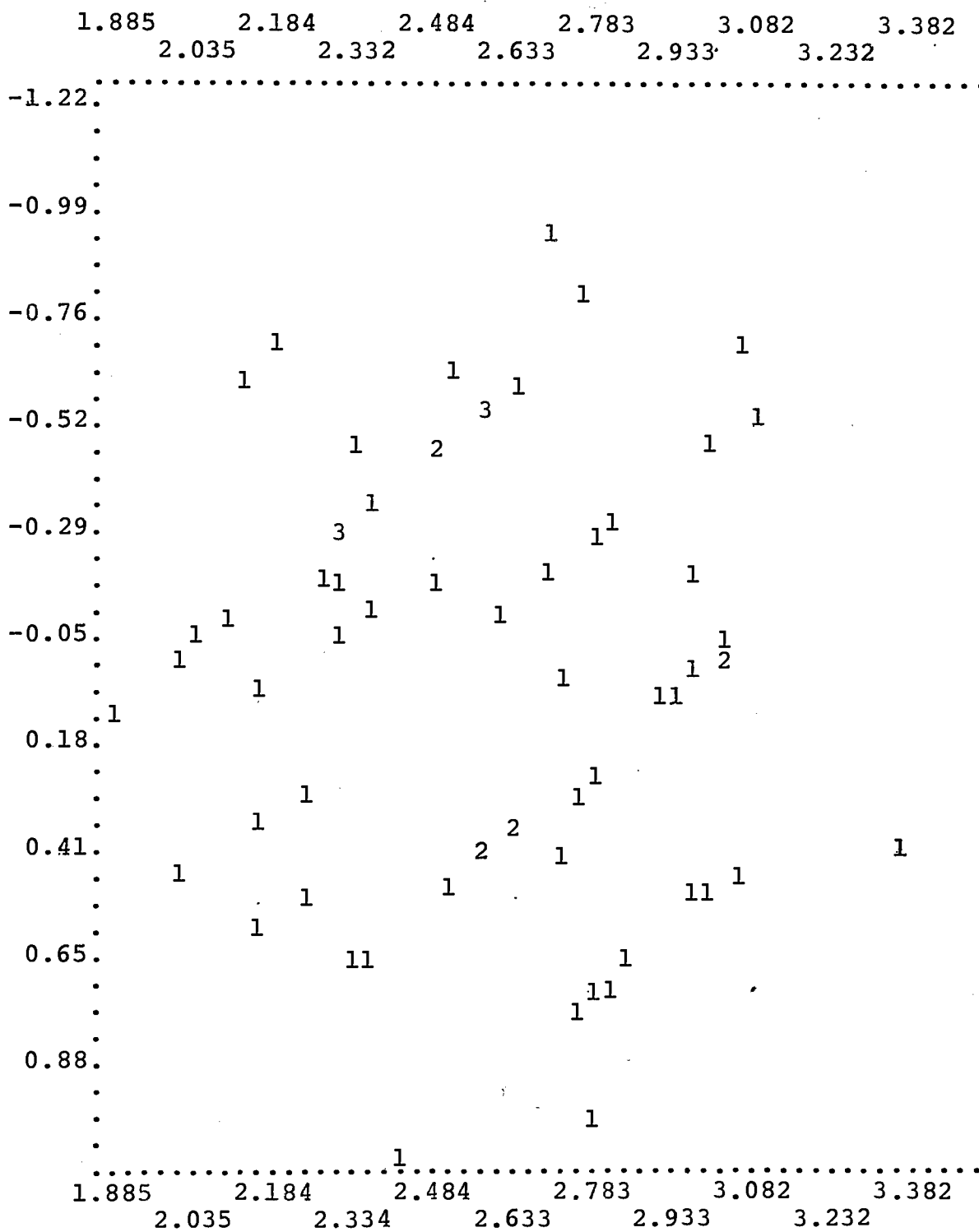
The analysis of the F-GPA prediction equation is given in Table 20. Fourteen personality measures and the candidates age were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a F-GPA is: F-GPA = 1.55743 + (-0.01845)Age of candidate + (0.00523)SN score + (0.00844)TF score + (-0.00508)JP score + (0.07672)Sa score + (0.08502)Nc score + (0.16382)Sy score + (0.05154)C score + (0.04979)IE score + (0.06502)EI score + (0.03506)EC score + (0.03360)WC score + (-0.06535)WA score + (0.01386)Theo score + (-0.01956)Econ score.

TABLE 20

PREDICTION EQUATION FOR F-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant =	1.55743)		
Age	-0.01845	0.00660	7.8122
SN	0.00523	0.00260	4.0383
TF	0.00844	0.00313	7.2909
JP	-0.00508	0.00257	3.8910
Sa	0.07672	0.01881	16.6355
Nc	0.08502	0.03088	7.8309
Sy	0.16382	0.04929	11.0465
C	0.05154	0.02290	5.0637
IE	0.04979	0.01391	12.8211
EI	0.06502	0.03076	4.4676
EC	0.03506	0.02074	2.8562
WC	0.03369	0.02895	1.3540
WA	-0.06535	0.02046	10.1996
Theo	0.01386	0.00790	3.0802
Econ	-0.01956	0.00822	5.6636

Analysis of Variance

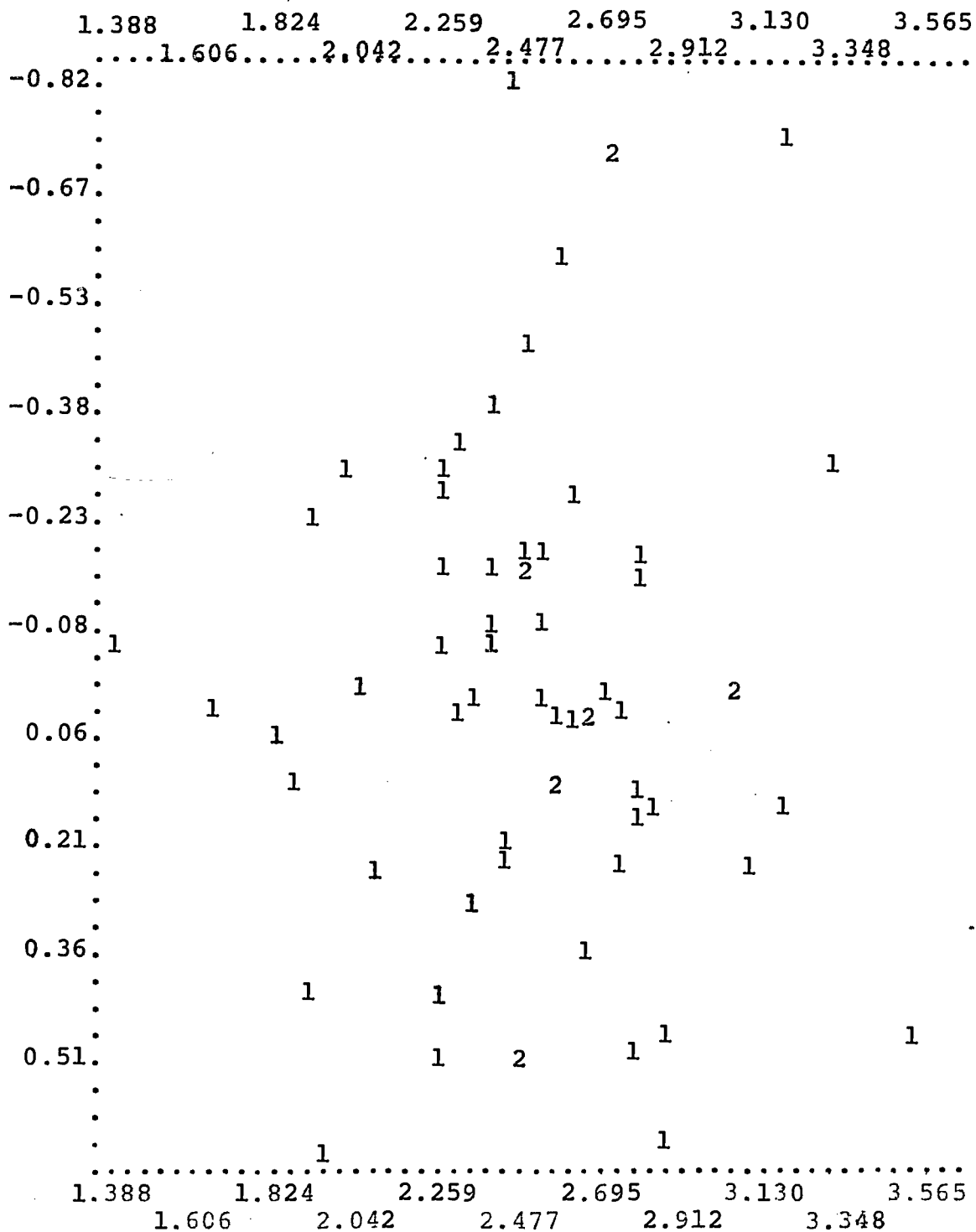|	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	15	9.959	0.664	4.934
Residual	51	6.863	0.135	

Table 21 summarizes the relative importance of each in-
dependent variable in the F-GPA prediction equation. The
Myers-Briggs sensing-intuition index (SN), accounted for 10
per cent of the average. Together with the values of the
other fourteen significant variables the total predictability
is almost 60 per cent.

TABLE 21

F-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1 ...... SN	0.3127 ..	0.0978 ..	0.0978 ...	7.0444
2 ...... Sa	0.4098 ..	0.1680 ..	0.0702 ...	5.3978
3 ...... WC	0.4699 ..	0.2208 ..	0.0529 ...	4.2761
4 ...... IE	0.5139 ..	0.2641 ..	0.0433 ...	3.6474
5 ...... WA	0.5475 ..	0.2998 ..	0.0356 ...	3.1041
6 ...... JP	0.5690 ..	0.3238 ..	0.0241 ...	2.1344
7 ...... Age	0.5983 ..	0.3580 ..	0.0342 ...	3.1404
8 ...... TF	0.6282 ..	0.3946 ..	0.0366 ...	3.5066
9 ...... Nc	0.6581 ..	0.4331 ..	0.0385 ...	3.8684
10 ...... Sy	0.6872 ..	0.4723 ..	0.0392 ...	4.1588
11 ...... C	0.7016 ..	0.4922 ..	0.0199 ...	2.1583
12 ...... Theo ...	0.7214 ..	0.5204 ..	0.0283 ...	3.1 21
13 ...... Econ ...	0.7335 ..	0.5381 ..	0.0176 ...	2.0207
14 ...... EI	0.7544 ..	0.5692 ..	0.0311 ...	3.7561
15 ...... EC	0.7694 ..	0.5920 ..	0.0228 ...	2.8562

The plot of residuals for the F-GPA is given in Table 22.
The residuals range from 0.51 to -0.82. They show similar
positive and negative variations across the spectrum of pre-
dicted averages.

TABLE 22

PLOT OF RESIDUALS FOR THE F-GPA

```
         1.388       1.824       2.259       2.695       3.130       3.565
          ....1.606.....2.042.....2.477.....2.912.....3.348.....
  -0.82.                                  1
       .
       .                                           2              1
  -0.67.
       .
       .                                  1
  -0.53.
       .                                1
  -0.38.                              1
       .                            1
       .              1          1                              1
       .                         1
  -0.23.                   1
       .                              11      1
       .              1    1  2 1       1
       .                                      1
  -0.08.                        1   1
       .  1                  1   1
       .              1       1          1   2
       .      1                    1 1  112 1          2
   0.06.          1
       .        1                   2
       .                                   1              1
   0.21.                       1          1
       .            1        1        1       1
       .                   1
   0.36.                              1
       .        1        1
       .                                1   1               1
   0.51.                   1      2      1
       .
       .                                1
        ....................................................
         1.388       1.824       2.259       2.695       3.130       3.565
            1.606       2.042       2.477       2.912       3.348
```

The analysis of the A-GPA prediction equation is given in Table 23. Eight personality measures and education were identified as significant predictors at the 0.25 level. The equation for predicting the observed value of a A-GPA is:

A-GPA = 0.08088 + (0.06954)years education + (0.00566)TF score + (-0.00239)JP score + (0.03243)S score + (0.04259)Sa score + (0.04928)Sy score + (0.04559)WC score + (-0.02590)TC score + (0.00226)Rokch score.

TABLE 23

PREDICTION EQUATION FOR A-GPA

Variable	Coefficient	Std. Error	F to Remove
(Constant =	0.08088)		
ED	0.06954	0.02458	8.0004
TF	0.00566	0.00209	7.3666
JP	-0.00239	0.00134	3.1864
S	0.03243	0.01538	4.4441
Sa	0.04259	0.01372	9.6387
Sy	0.04928	0.03014	2.6743
WC	0.04559	0.01962	5.3992
TC	-0.02590	0.01362	3.6174
Rokch	0.00226	0.00140	2.5907

Analysis of Variance

	DF	Sum of Sqs.	Mean Sq.	F Ratio
Regression	9	3.332	0.370	5.581
Residual	57	3.781	0.066	

Table 24 summarizes the relative importance of each in-
dependent variable in the A-GPA prediction equation.

When the six other GPA's were averaged according to the
previously described weighted formula (page 17), the final
Adjusted GPA was obtained for each candidate. Nine weighted
independent variables significantly contributed to predicting
almost 47 per cent of this average. The Myers-Briggs thinking-
feeling (TF), and judgement-perception (JP), indexes contri-
buted 14 per cent. The Personal Orientation Inventory time
competence (TC) score, self-regard index (Sa), spontaneity
index (S), and synergy index (Sy), accounted for 18 per cent.
The FIRO-B score measuring wanted behavior toward others to
influence self (WC), 6 per cent. The Rokeach dogmatism scale
(Rokch), 4 per cent, years education (ED), 5 per cent toward
the A-GPA.

TABLE 24

A-GPA SUMMARY TABLE

Step Number	Variable Entered	Multiple R	R^2	Increase in R^2	F Value to Enter
1	TF	0.3317	0.1100	0.1100	8.0363
2	Sa	0.4493	0.2019	0.0918	7.3646
3	WC	0.5160	0.2662	0.0644	5.5254
4	ED	0.5631	0.3171	0.0509	4.6203
5	Rokch	0.6004	0.3605	0.0433	4.1331
6	S	0.6288	0.3954	0.0350	3.4684
7	JP	0.6499	0.4224	0.0270	2.7538
8	TC	0.6660	0.4435	0.0211	2.2035
9	Sy	0.6844	0.4684	0.0249	2.6743

Table 25 gives the plot of residuals for the A-GPA. The
errors of prediction range from 0.63 to -0.51. Negative and
positive residuals are similarly scattered across the spectrum
of averages.
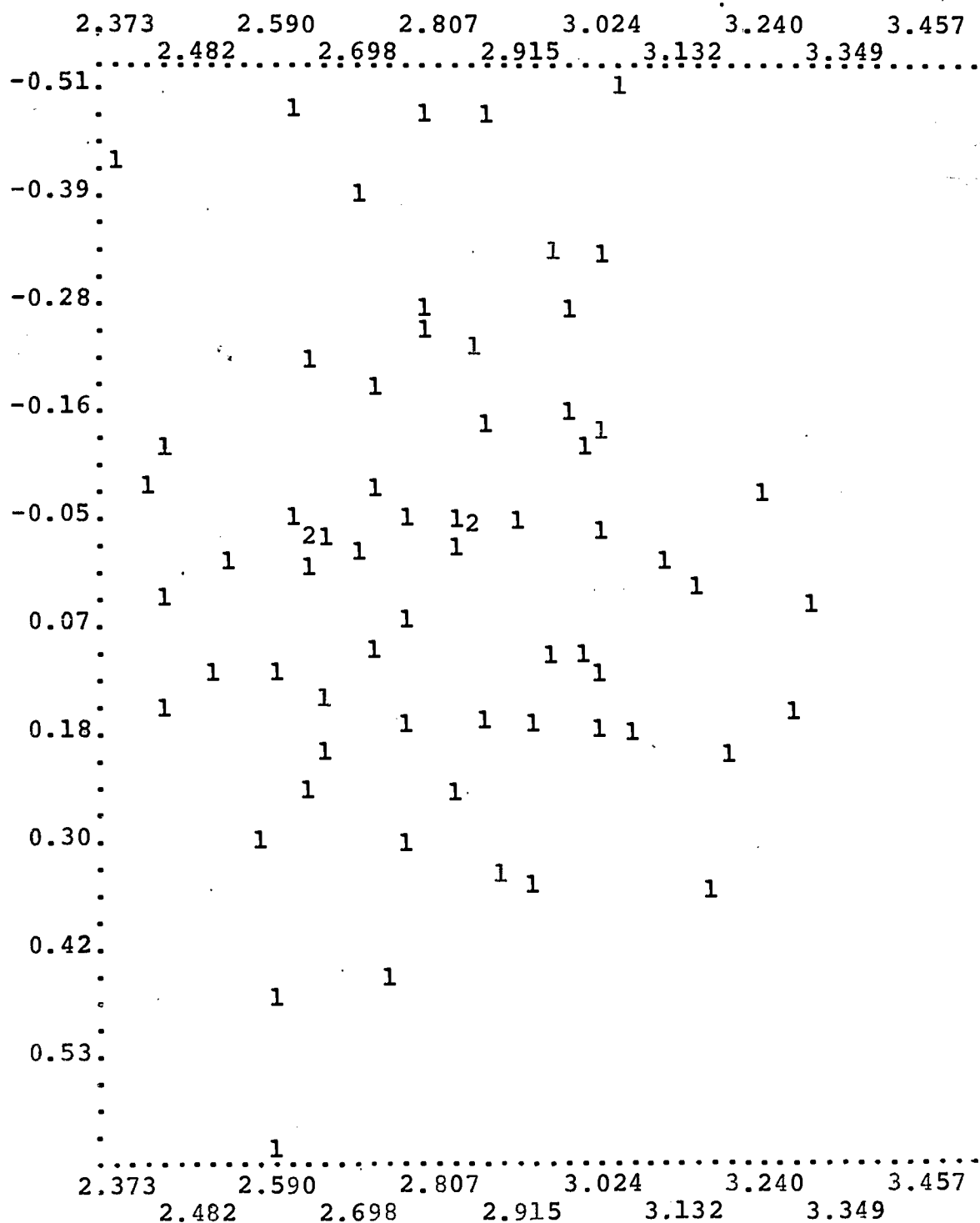
TABLE 25

PLOT OF RESIDUALS FOR THE A-GPA

Table 26 summarizes the multiple correlation coefficients for each dependent variable. When R = 1.00 there is total predictability of the dependent variable from the independent variables. When R = 0.00 there is no relationship between the variables. The standard error of the estimate (S.E.), is the square root of the error variance, which is the mean of squared deviations from predicted values.[89] An R of 0.68 accounts for about 46 per cent, (R^2), of the observed value. When the S.E. is 0.26 the mean of squared deviation from the predicted value is about 0.07. Prediction equations generated for the A-GPA, F-GPA, U-GPA, PE-GPA, and P-GPA have higher R values and lower S.E. values than the S-GPA and AA-GPA equations.

TABLE 26

MULTIPLE CORRELATION COEFFICIENTS (R)
AND STANDARD ERROR OF ESTIMATES (S.E.)
OF THE DEPENDENT VARIABLES AFTER STEPWISE
REGRESSION ANALYSIS (N=67) p=.25

Variable	R	S.E.
U-GPA	0.68	0.36
P-GPA	0.72	0.48
S-GPA	0.63	0.53
PE-GPA	0.65	0.44
AA-GPA	0.55	0.52
F-GPA	0.77	0.37
A-GPA	0.68	0.26

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[89]George H. Weinberg and John A. Schumaker, Statistics: An Intuitive Approach (Belmont, California: Wadsworth Publishing, 1964), p. 244.

SUMMARY AND CONCLUSIONS

Prediction Profiles

The general hypothesis, that there is a predictive rela-
tionship between various personality measures and earned
grade point averages in seven areas of the MEDEX program
evaluation, is acceptable within the defined significance
level of the statistical matrix. Table 27 summarizes the
significant predictors for each dependent variable. Scores
from the Myers-Briggs Type Indicator significantly contributed
to the prediction of five of the seven GPA's. Various Per-
sonal Orientation Inventory scores and expressed and wanted
behavior scores of the FIRO-B significantly contributed to
the predictability of all GPA's. The I-E and Rokeach scales
each added significantly to three prediction equations. The
scores from the Study of Values significantly contributed to
all but one GPA. Of the three remaining variables, age,
medical experience, and years education, only education proved
to be significant in more than one equation. The predictors
of higher GPA's will be summarized for each equation.

U-GPA

The U-GPA prediction equation provides the evidence re-
quired to accept the first hypothesis: There is a predictive
relationship between various personality measures and the
University phase grade point average.

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TABLE 27

A SUMMARY OF THE SIGNIFICANT PREDICTORS

Dependent Variables	Independent Variables									
	Myers-Briggs	POI	I-E	Rokch	FIRO-B	Study of Values	Age	MD	Exp	ED
U-GPA	-	C,I	-	X	EI, EC	Theo, Econ,Aest	-			X
P-GPA	SN, TF, JP	S, Sa, Sy, TC	-	-	EI,EC,EA WI,WC	Econ	-	-		X
S-GPA	SN, TF, JP	S,Nc,Sy, A,C	-	X	WI,EA	Aest,Soci,Relg	-	X		-
PE-GPA	TF	Ex,S,Sr, Nc,A,C	X	-	EI,WA	Theo,Aest	-	-		-
AA-GPA	-	S,Sr,TC	X	-	WC	Soci,Polt	-	X		X
F-GPA	SN, TF, JP	C,Sa,Nc, Sy	X	-	EI,EC, WC,WA	Theo,Econ	-	-		-
A-GPA	TF, JP	S,Sa,Sy, TC	-	X	WC	-	-	-	-	X

Positive equation coefficients indicate that higher independent variable values contributed to a higher predictive GPA. These included education (ED), expressed control (EC), aesthetic (Aest) values, reactivity orientation (I), and dogmatism (Rokch).

Negative equation coefficients indicate that the lower independent variable values contributed to a higher predictive GPA. These independent variables were expressed inclusion (EI), capacity for intimate contact (C), theoretical (Theo), and economic values (Econ).

The more successful candidate, then, in terms of the University grade point average, had more post-high school academic experience, preferred exerting influence over others, favored values where the dominant motivation is form and harmony, was more oriented toward inner-directedness and independence, and was more dogmatic about belief systems. He also preferred not to belong to a group, had more difficulty with warm interpersonal relations and did not express a dominant interest in truth or in economic values.

P-GPA

The P-GPA prediction equation provides the evidence required to accept the second hypothesis: There is a predictive relationship between various personality measures and the preceptor evaluation earned grade point average.

Positive equation coefficients included education (ED), the thinking-feeling index (TF), the spontaneity index (S), the self-acceptance index (Sa), the synergy index (Sy), wanted

inclusion (WI), wanted control (WC), expressed affection (EA) behaviors, and economic values (Econ). Negative coefficients included the sensing-intuitive index (SN), the judgement-perception index (JP), expressed inclusion (EI), and control (EC) behaviors, and the time competency scale (TC).

The more successful candidate, in terms of the preceptor-physician evaluation measured by a grade point average, had more academic experience, preferred feeling rather than thinking in personality type and was more apt to freely express his feelings. He also had a greater tendency to accept himself in spite of weaknesses and was more likely to see opposites in life as meaningfully related. He wanted to be included in groups and had a tendency toward preferring to be controlled by others; however, he had more need to express friendship. He expressed a dominant interest in economic values.

The more successful candidate was a sensing rather than an intuitive personality type and preferred judgement to perception when dealing with his environment. He generally did not express a need for others to seek to include him or seek to control his behavior. He was more time incompetent than competent, preferring to live in the past or future rather than the present.

S-GPA

The S-GPA prediction equation demonstrates the acceptability of the third hypothesis: There is a predictive relationship between various personality measures and the site-

visit earned grade point average. Candidates earning higher GPA's in this area of program evaluation had more years medical experience (MD Exp), preferred feeling to thinking (TF), and perception to judgement (JP) in their approach to the environment. They were more inclined to freely express their feelings behaviorally (S), see man as essentially good (NC), see meaningful relationships between opposites of life (Sy), and accept their own feelings of anger or aggression (A). They wanted to be included and maintain a positive relationship with other people (WI); they were motivated to value form and harmony (Aest), and altruism (Soci).

Higher scoring candidates were sensing as opposed to intuitive types (SN), and did not prefer to express affection (EA). Their measured capability to establish warm interpersonal relationships (C) was not as high, and they were not as motivated toward valuing a mystical universal unity (Relg). They tended, however, to be more open-minded (Rokch).

PE-GPA

The PE-GPA prediction equation provides the necessary evidence to accept the fourth hypothesis: There is a predictive relationship between various personality measures and the physical examination audit earned grade point average. The candidate earning a higher average on this variable relied more on a feeling kind of judgement (TF), and tended to perceive personal reward as dependent on his own behavior (IE). He tended toward being more rigid in his application of values (Ex), and more ready to react spontaneously (S). He

had a higher self-regard (Sr), and viewed man as more evil
than good (Nc). He more readily accepted his feelings of
aggression (A), but had more difficulty with warm interper-
sonal relationships (C). He expressed a need to establish
positive relationships (EI), but did not want those relation-
ships to include affection (WA). He placed more interest in
truth (Theo), form and harmony (Aest).

AA-GPA

The AA-GPA prediction equation provides the required
evidence to accept the fifth hypothesis: There is a predic-
tive relationship between various personality measures and
the algorithm audit earned grade point average. The more
successful candidate, in terms of this evaluation, had less
academic experience (ED), and was interested more in altruis-
tic motives (Soci) and power (Polt) values. He also perceived
less in his own ability to control events (IE), and lived
more in the past or future than the present (TC). He was
capable of expressing his feelings behaviorally (S), and
wanted to control relationships established with others (WC).
He had a higher self-worth (Sr).

F-GPA

The F-GPA prediction equation provides the evidence
necessary to accept the sixth hypothesis: There is a predic-
tive relationship between various personality measures and
the final examination grade point average. Candidates earning
higher scores on the final examination were intuitive (SN),

feeling (TF), and judgement (JP) oriented personality types.
They were younger (Age) candidates, interested in truth
(Theo) and expressing a need to establish (EI) and control
(EC) positive relationships with others; however, they did not
want such relationships which involved the affection needs of
others (WA). They preferred control by others in their rela-
tionships (WC). They had more synergistic awareness, seeing
opposites as related (Sy), and man as essentially good (Nc).
They had more capacity for intimate contact (C). These can-
didates were motivated toward economic values (Econ).

A-GPA

The A-GPA prediction equation provides the evidence
necessary to accept the final hypothesis: There is a predic-
tive relationship between various personality measures and
total adjusted earned grade point average. Candidates
earning better overall grades in the areas of program evalua-
tion had more previous academic experience (ED), and were
oriented toward feeling (TF), and judgement (JP) personality
types. They had more spontaneity of feeling (S), self-
acceptance (Sa), and synergy (Sy); however, they were not as
present oriented as others (TC).

They wanted positive relationships with others, but
needed their control in the relationships (WC). The more
successful candidate was more dogmatic (Rokch).

Discussion

Other personality characteristics have been described for physician extenders.[90,91,92,93] The results presented in these studies are difficult to compare because of the very diverse nature of the many variables measured. Those characteristics associated with success in the various areas of evaluation are, however, consistent with most common sense expectations and in part corroborated by other studies.

Since the same personality measures do not contribute to success prediction in each area of evaluation, different objectives seem to be best achieved by different personalities. Those behavioral objectives which require more cognitive ability, such as the objectives described during the University program, require different characteristics of personality than do the objectives associated with manipulative and interpersonal skills, such as those described for the preceptor evaluation.

It is not surprising to find the predictor variables of

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[90]LeRoy A Stone, et al., "Psychological Test Scores for a Group of MEDEX Trainees," Psychological Reports 31(1972): 828-831.

[91]Elaine Crovitz, Mary M. Huse, and David E. Lewis, "Selection of Physician's Assistants," The Journal of Medical Education 48(1973):551.

[92]Beverly C. Flynn, Shirly A. Ross, and Robert B. Chevalier, "Characteristics of the Most Successful Students in a Family Nurse Practitioner Program," Proceedings of the Second National Conference on New Health Practitioners (New Orleans: 1974), 28.

[93]Jimmie L. Pharris, "Prediction Equations for the Selection of Physician's Assistant Trainees," Proceedings of the Second National Conference on New Health Practitioners (New Orleans: 1974), 67.

the A-GPA made up of variables found in the U-GPA and P-GPA equations since they accounted for 60 per cent of the total evaluation. The A-GPA equation may contain the most effective predictors of educational success for this health related technical education program. Most effective, that is, in terms of a value judgement based on the amount of information acquired sufficient to justify time and money expenditures.

The personality traits associated with a higher total GPA do not seem to be inconsistent with the particular behavioral objectives of either vocational training programs in general or technical students. The Data Compatibility Group of the National Center for Educational Statistics of the U.S. Office of Education (1966) has ascribed the following characteristics to technical education:[94]

> Technical education is concerned with that body of knowledge organized in a planned sequence of classroom and laboratory experiences, usually at the post-secondary level, to prepare pupils for a cluster of job opportunities in a specialized field of technology. The program of instruction normally includes the study of underlying sciences and supporting mathematics inherent in a technology, as well as methods, skills, and materials, and processes commonly used and services performed in the technology. Technical education prepares for the occupational area between the skilled craftsman and the professional such as the doctor, the engineer, and the scientist.

Roney described the technical student at a symposium held by the American Association for the Advancement of

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[94]U.S. Department of Health, Education, and Welfare, Office of Education, Third Draft of Standard Terminology for Instruction in Local and State School Systems, Handbook No. 6 of State Educational Records and Reports Series, May, 1967.

Science in 1968.[95]

> The typical technical student is intensely interested
> in a specialized field of study. He comes to the
> technical program because of its positive values -
> not because he cannot study in some other field. He
> is, in a sense, a fugitive from general education;
> tired of taking "subjects" and anxious to get his
> teeth into something interesting. He comes to learn
> electronics, or metallurgy, or industrial chemistry,
> not more of the same things he studied in high
> school. Indeed, he is quite likely to be conditioned
> to dislike general education by years of unhappy
> experience in secondary school. Furthermore, the
> typical student in a technical program is likely to
> be more mature than the usual high school graduate.
> He may very well have worked for a year or two since
> leaving high school. It is not unusual for individuals
> with one or more years of college credit to enter
> these special purpose programs.

The medex trainee with the overall higher measure of
success had a little more than a year of college credit and
was more future or past oriented toward specific goal achieve-
ment or direction. He was a feeling personality type with a
judgement approach to his environment. He tended to be more
dogmatic, but he was also more subject to influence by others.
He had a higher self-acceptance and valued his fellow man.
These characteristics do not conflict with any of the values
of vocational men or technological objectives. In fact, these
values would seem quite acceptable to the more successful
trainees.

Two primary conclusions are prompted by these results:
1) psychological characteristics associated with success in

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[95]Science and Education as it Relates to Technical Edu-
cation. Symposium at the 1968 Annual Meeting of the American
Association for the Advancement of Science (Dallas, Texas,
1968), p. 4.

meeting certification requirements have been identified in a physician extender (MEDEX) program, and 2) multiple regression prediction equations in seven areas of cognitive psychomotor and interpersonal skills have been described.

An adequate data base has been created from which future longitudinal studies could be conducted. New and similar groups of medex candidates may be tested to validate and further refine this study.

A single test could be constructed to gather the data required for any single prediction equation. For instance, test items could be taken from the Myers-Briggs Type Indicator (TF and JP indexes), the Personal Orientation Inventory (S, Sa, Sy, and TC scales), the FIRO-B (WC score), the Study of Values, and added to the Rokeach Scale. All necessary data would then be available for the prediction of some adjusted grade point average (A-GPA). Such analysis could be valuable when screening candidates for admissions, counseling, or in defining personality variables which may be associated with long term occupational success.

Scholastic achievement entrance examinations may be valuable in predicting performance in certain physician extender educational programs. There are, however, non-traditional characteristics significantly associated with program success. Past academic experience and certain psychological characteristics do contribute substantially toward an understanding of these new health practitioners, the medex.

APPENDIX A

Selected Materials Developed to Measure

Training Objectives and Used to Calculate

The Various G.P.A.'s

U-GPA

Physical Diagnosis

Date:_____

CLINICAL INSTRUCTOR EVALUATION FORM

Medex:_____

Please evaluate - Attitude, Ability, Progress, Orientation

1. Pertinent History and Physical Examination:

2. Patient Education: Protocol

3. Problem Evaluation:

4. Other: (Records, interpersonal relations, etc.)

Supervisor:_____M.D.

Introduction to Problem Oriented Medicine - Auscultation

Briefly answer the following questions:

1. What causes the first heart sound?

2. What causes the second heart sound?

3. List the heart sounds audible in most hearts:

4. What sounds do you identify with:

   a) apex area:

   b) xyphoid:

c) left base:

d) right base:

5. Why do stethoscopes have an open bell?

6. Why do stethoscopes have a diaphragm?

Laboratory Medicine - Laboratory Learning Aids

Introduction to Blood Cell Morphology

Post-Study Examination Answer Sheet

Circle the one most correct answer:

Slide a   Slide e

Question 1. A B C D   Question 1. A B C D E F

2. A B   Slide f

3. A B C D E F   Question 1. A B C D E F

Slide b   Slide g

Question 1. A B C D   Question 1. A B C D E F

2. A B   Slide h

3. A B C D E F   Question 1. A B C D E F

Slide c   Slide i

Question 1. A B C   Question 1. A B C D E F

2. A B   Slide j

3. A B C   Question 1. A B C D E F

4. A B C D E F

Slide d

Question 1. A B

2. A B

3. A B C D E F

P-GPA

MEDEX-SOUTH CAROLINA

Medical University of South Carolina
80 Barre Street
Charleston, South Carolina 29401

Preceptor
Medex Evaluation

Date_____ Medex_____ Preceptor_____

In order to document the performance of your Medex, would you
please complete this evaluation. You will be asked to eval-
uate your Medex again in the next quarter. Collectively these
evaluations will form the single most important set of obser-
vations to be considered in the certification of your Medex.

Please complete and return as soon as possible to the above
address.

Please use the following evaluation scale:

SUPERIOR   4   Generally outstanding in ability to
                       accomplish assigned tasks/expectations

GOOD   3   Usually exceeds reasonable expectations

SATISFACTORY   2   Usually meets reasonable expectations,
                       but does not generally go beyond them

DOUBTFUL   1   Meets reasonable expectations, but
                       usually requires much motivation to
                       do so

UNSATISFACTORY   0   Often falls short of reasonable expec-
                       tations, and needs constant supervision

NOT DETERMINED   ND   Do not have sufficient information to
                       evaluate

I. DATA COLLECTION

History and Physical Examination (Consider thoroughness, reliability, efficiency, terminology)

A. Complete history _____

B. Limited (directed) history _____

C. Complete physical _____

D. Limited (directed) physical _____

COMMENTS:

II. ANALYTIC ABILITY

A. Is problem list complete? _____
(Medex should be able to
identify all problem areas -
active and inactive)

B. Is problem list well formulated? _____
(Problems should be accurately
defined at level justified by
the data available and by the
knowledge and understanding of
the medex.)

COMMENTS:

III. RECORD KEEPING

A. Are entries legible? _____

B. Are entries accurate? _____

C. Are entries complete? _____

COMMENTS:

IV. CLINICAL PERFORMANCE

A. Is work efficient/well
organized? _____

B. Is Medex interested/well
motivated? _____

C. Does Medex seek help/
supervision when appropriate? _____

D. Does Medex learn from experience
    and teaching?   _____

E. Effort at self-education?   _____

COMMENTS:

V. <u>PERSONAL</u> <u>QUALITIES</u>

A. Integrity/honesty?   _____

B. Interpersonal relationships
    (office/hospital personnel,
    physicians)?   _____

C. Professional bearing
    (Compassion, empathy, sensitivity;
    are the relationships with
    patients warm but dignified)?   _____

D. Response to criticism?   _____

COMMENTS:

VI. <u>MEDICAL</u> <u>LOGIC</u> <u>SKILLS</u> <u>AND</u> <u>ENVIRONMENT</u>

Algorithms:

Are you and your Medex using the Algorithms:
(Check where appropriate)

	M.D.	Mx
Whenever indicated	____	____
Most of the time indicated	____	____
Occasionally when indicated	____	____
Never	____	____

A. Ability of Medex to follow good Medical logic?

B. Ability to correctly complete checklist?

C. Agrees with you on patient evaluation?

D. Follows your protocols as directed?

E. Readiliy utilizes your abilities to supervise?

COMMENTS:

Do you have any major criticisms of your Medex write-ups
so far?   Yes _____   No _____

Explain:

How many physical examinations of all types does the Medex
do in a typical week? _____

<u>Evaluate</u> performance of work done in:

	GRADE	NOT DONE
office	_____	_____
hospital	_____	_____
nursing home	_____	_____
house calls	_____	_____
other	_____	_____

Describe:

A.   Evaluate the Medex approach to terminology:

B.   The Medex grasp of topographical anatomy:

C.   Relationship with:

Administration at hospital _____

Your office Staff _____

Other physicians _____

Patients _____

Nurses _____

Other Allied Health Personnel _____

General community _____

What community activities is your Medex involved in?

_____

Final Preceptor Report

I.   HISTORY TAKING

A.   Elicits data that are pertinent to the
evaluation of the patient's problem or
condition.   _____

B.   Elicits pertinent negatives.   _____

C. Avoids the inclusion of non-pertinent historical data. _____

D. Is consistent in the quality of the histories obtained. _____

II. PHYSICAL EXAMINATION

A. Gathers physical data that are pertinent to the evaluation of the patient's problem or condition. _____

B. Avoids examination procedures which might be harmful to the patient or cause undue discomfort. _____

C. Looks for pertinent negatives in examining the patient. _____

D. Accurately identifies and describes physical findings. _____

E. Distinguishes correctly between normal and abnormal findings. _____

F. Is consistent in the quality of physical examination performed. _____

III. LABORATORY TESTS AND DIAGNOSTIC PROCEDURES

A. Uses appropriate judgment in selecting tests and procedures which will yield the most pertinent diagnostic data. _____

B. Performs clinical procedures (e.g., venipuncture, collecting specimens) skillfully and with careful attention to patient welfare. _____

C. Appropriately interprets the results of diagnostic tests and procedures. _____

D. Is consistent in the level of judgment used in selecting tests and procedures. _____

IV. MANAGEMENT/TREATMENT

A. Formulates appropriate conclusions based upon available diagnostic data. _____

B. Appropriately refers patients to physician as needed _____

C. Gathers significant and pertinent diagnostic data during follow-up evaluations of the patient. _____

D. Identifies needed changes in treatment plans _____

E. Recognizes his/her own limitations and takes appropriate action. _____

V. MEDICAL RECORDS

A. Maintains accurate patient records. _____

B. Appropriately utilizes patient records in evaluating the health status and needs of patients. _____

C. Prepares accurate and concise patient summaries. _____

VI. INTERPERSONAL RELATIONS

A. Provides accurate information regarding health status to patients and their families. _____

B. Deals effectively with different patient personalities. _____

C. Answers patient's questions without frightening, angering, or embarrasing him/her. _____

D. Uses language appropriate to patient's educational and social background. _____

E. Establishes good working relations with other members of the health team. _____

F. Provides instructions effectively to patients and family regarding continuing care. _____

S-GPA

Medex Site Visit Checklist - South Carolina

Medex Name: _____ Visited by: _____

Preceptor Name: _____ Type Practice:_____

Date/Time of Visit:_____ Location: _____

I.   ALGORITHMS

1. Are the physician and Medex using the algorithms?

                                        M.D.   Mx

       whenever indicated   _____ _____
       most of the time indicated   _____ _____
       occasionally if indicated   _____ _____
       never   _____ _____

2. Will the practice use algorithms after the training
    period?
                                        M.D.   Mx

       yes   _____ _____
       perhaps   _____ _____
       no   _____ _____

3. What is the attitude toward the algorithms?

                                        M.D.   Mx

       acceptance   _____ _____
       tolerance   _____ _____
       hostility   _____ _____
       other (describe)   _____ _____

       _____

4. How is the practice using the algorithms?

                                        M.D.   Mx

       as directed   _____ _____
       other (describe)   _____ _____

       _____

5. What difficulties have arisen with the use of
    the algorithms?

                                              M.D.   Mx

        they take too much time   ____   ____
        MD/Mx should not be seen
         using a book in front
         of patients   ____   ____
        disagreement over logic
         (describe)   ____   ____

_____

II.   WORK-UPS

1. How many complete work-ups is the Medex doing in
    a typical week? _____

2. Where does he carry them out?
    ___Office ___Hospital ___Nursing Home ___Other

    (describe)_____

3. Does the physician review and critique Medex work-
    ups?   ___Yes ___No (describe)

_____

4. Have there been any difficulties or misunderstand-
    ings about:
    a. work-up requirement of 2/month: ___Yes ___No

        (describe)_____

    b. the Medex approach to problems and terminology?

_____

5. Major criticism of write-ups done so far (describe)

    MD/Mx_____

III. RECORDS

1. How are the algorithms incorporated in the patient's
    chart?

        ___checklist in chart   ___combination of above
        ___handwritten note   (describe)
        ___dictated and typed   ___not incorporated
           note   ___other (specify)_____

_____

2. How is other Medex activity incorporated in the patient's chart?
___handwritten note ___dictated and typed note
___other (describe)

_____

3. Is the Medex' contribution to patient care adequately represented in the record?

_____

4. Problem Oriented Medical Record status (describe):

___using the POMR system in practice (conversion from other systems in program)
___not using POMR in practice
___using POMR but having problems and need PROMIS help
___using POMR with no problems

IV. PRACTICE

1. What facilities and/or equipment are provided for Medex use?

___office unit with desk ___lab
___examining room ___professional library
___other (describe)

_____

2. How does the Medex spend his 24 hour day?

_____

_____

3. Assess the degree to which the special skills of this specific Medex are utilized.
___fully ___partially ___minimally ___not at all

Comment:_____

4. Assess the quality of teaching and supervision provided by the preceptor:

_____

5. Is the Medex working with physicians other than his preceptor? ___No ___Yes

6. If #5 is YES, describe the situation:
   a. names of the physicians and their specialties or areas of concentration.
   b. the percentage of Medex time spent with each physician.
   c. the activities in which the Medex participates with each physician.
   d. an assessment of the quality of supervision and teaching provided by each physician.

_____

_____

V. OTHER AREAS

1. Describe any specific plans for additional training skills for the Medex for remainder of preceptorship.

   a. by the preceptor_____

   b. by others_____

2. How will the Medex be utilized in the practice in the future?

_____

3. What is the current status of acceptance of the Medex by:

   a. the hospital(s)_____
   b. preceptor's office staff_____
   c. other physicians_____
   d. patients_____
   e. nurses_____
   f. other allied health personnel_____

4. How are the Medex and his family making the adjustment to the practice and to the new relationships flowing from his new professional status?

_____

5. Professional Recognition?

   a. Is the Medex a member of the County Medical Society?   ___Yes ___No
   b. Is the Medex allowed to attend Medical Society Meetings?   ___Yes ___No
   c. Is the Medex attending professional meetings at the hospital?   ___Yes ___No
   d. What other professional meetings is the Medex attending?_____

PE-GPA

OBSERVED HISTORY AND PHYSICAL EXAM FORM
MEDEX South Carolina

Medex _____

Rater _____
Scale:
0=missed   2=adequate
1=superficial 3=complete
NA=not applicable

I.
Data Collection Skills
Obtains History of:

Presenting Illness:

Onset	0	1	2	3	NA
Duration	0	1	2	3	NA
Location	0	1	2	3	NA
Radiation	0	1	2	3	NA
Frequency	0	1	2	3	NA
Factors decreasing ...	0	1	2	3	NA
Factors increasing ...	0	1	2	3	NA
Effect on patient	0	1	2	3	NA
Associated symptoms ...	0	1	2	3	NA
Previous episodes	0	1	2	3	NA
Past Medical History: .	0	1	2	3	NA
Family Medical History:	0	1	2	3	NA

Review of Systems:

General appearance	0	1	2	3	NA
Skin	0	1	2	3	NA
HEENT	0	1	2	3	NA
C.V.	0	1	2	3	NA
Chest	0	1	2	3	NA
G.I.	0	1	2	3	NA
G.U.	0	1	2	3	NA
Musculoskeletal	0	1	2	3	NA
Neurological	0	1	2	3	NA
Gynecological	0	1	2	3	NA

COMMENTS:

II. Physical Exam

HEENT

a. Used appropriate sequence ...0 1 2 3 NA
b. Used appropriate technique ...0 1 2 3 NA
c. Used instruments correctly ...0 1 2 3 NA
d. Identified objective data ...0 1 2 3 NA

Chest

a. Used appropriate sequence ...0 1 2 3 NA
b. Used appropriate technique ...0 1 2 3 NA
c. Used instruments correctly ...0 1 2 3 NA
d. Identified objective data ...0 1 2 3 NA

Cardiovascular

a. Used appropriate sequence ...0 1 2 3 NA
b. Used appropriate technique ...0 1 2 3 NA
c. Used instruments correctly ...0 1 2 3 NA
d. Identified objective data ...0 1 2 3 NA

Abdomen

a. Used appropriate sequence ....0 1 2 3 NA
b. Used appropriate technique ...0 1 2 3 NA
c. Used instruments correctly ...0 1 2 3 NA
d. Identified objective data ....0 1 2 3 NA

Other _____

a. Used appropriate sequence ....0 1 2 3 NA
b. Used appropriate technique ...0 1 2 3 NA
c. Used instruments correctly ...0 1 2 3 NA
d. Identified objective data ....0 1 2 3 NA

Overall Impression of Physical Exam
....0 1 2 3 NA

III. <u>Problem Identification</u>

   a. Identification of problems 0   1   2   3   NA

   b. Analysis of problems 0   1   2   3   NA

IV. <u>Problem Management</u>

   a. Instituted appropriate treatment 0   1   2   3   NA

   b. Recommended further work-up 0   1   2   3   NA

V. <u>Behavioral Skills</u>

   a. Use appropriate interview techniques .. 0   1   2   3   NA

   b. Worked with patient 0   1   2   3   NA

   c. Consulted appropriately with preceptor. 0   1   2   3   NA
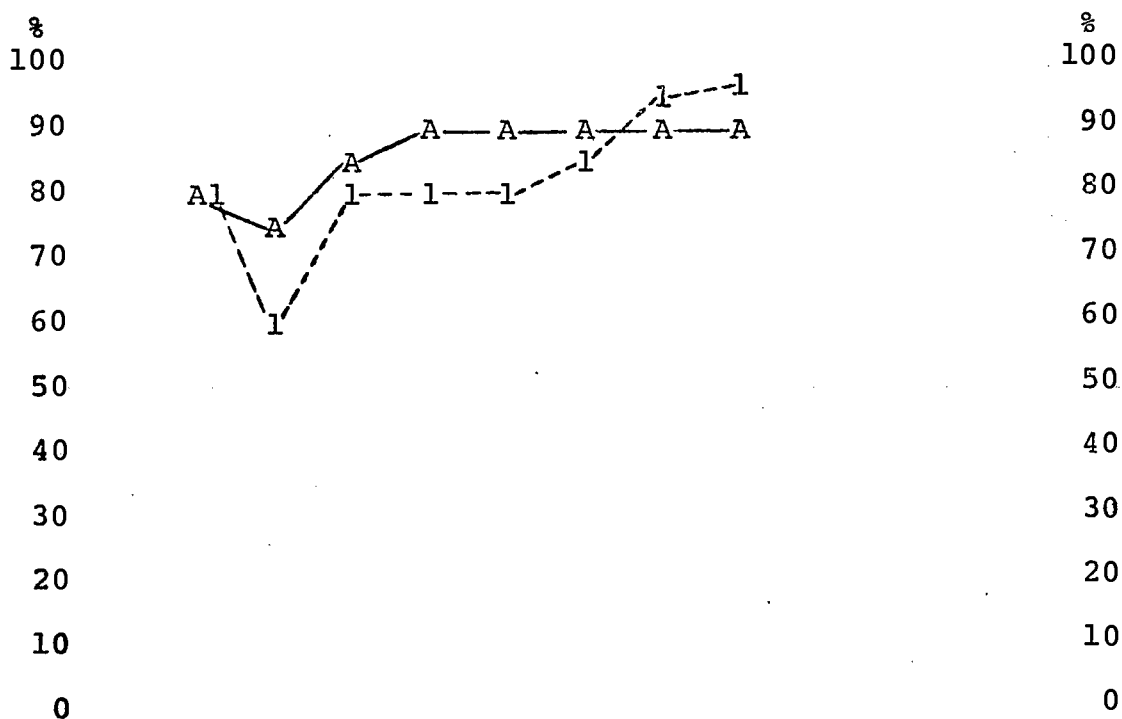
COMMENTS:

AA-GPA

MX: **42**
GROUP DEFINED BY MX AS: 42-48

TABLE OVER TIME IN TRAINING OF CERTAIN
TRACER ITEMS

NUMBER CODES REPRESENT INDIVIDUAL MEDEX
LETTERS REPRESENT THE GROUP

1,A - % CHECKLISTS WITH NO LOGIC ERROR

(MONTH 0 CONTAINS ALL CHECKLISTS FOR
WHICH MONTH WAS INDETERMINATE)

MO:	0	1	2	3	4	5	6	7	8	9	10	11	12
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct				

Checklists:

0	20	20	20	20	20	20	20	0	0	0	0	0

Checklists/No error:

0	16	12	16	16	16	17	19	0	0	0	0	0

FOR THE GROUP:

Checklists:

0	140	140	140	140	120	140	140	0	0	0	0	0

Checklists/No errors:

1	116	108	119	126	113	132	131	0	0	0	0	0

97

F-GPA

Simulated Patient Problem
              "COUGH"

     You have had a severe cough for about a week and
produce a thick yellow sputum. You smoke over two (2)
packages of cigarettes per day, but this has only been
for 10 years.

     You take no regular medication, are not short of breath
and have no chest pain. You have never been tested for T.B.
nor had a chest x-ray.

     You have had several chest colds over the past few
years.

     You have not been exposed to strep, have no runny nose,
dental/facial pain, or chronic diseases. You have not
taken your temperature lately.

     All other aspects of your medical history are normal.
Answer all other questions for real.

     You will have a directed physical examination and will
evaluate the performance of the practitioner on your problem.

PATIENT-PRACTITIONER INTERACTION
Evaluation of Intermediate Level Health Practitioner
Medical University of South Carolina

Student:_____Problem_____Actor/Patient_____

sympathetic	_ : _ : _ : _ : _ : _					unsympathetic
skillful	_ : _ : _ : _ : _ : _					clumsy
competent	_ : _ : _ : _ : _ : _					incompetent
confusing	_ : _ : _ : _ : _ : _					clear
close	_ : _ : _ : _ : _ : _					distant
friendly	_ : _ : _ : _ : _ : _					hostile
irritable	_ : _ : _ : _ : _ : _					pleasant
passive	_ : _ : _ : _ : _ : _					active
inattentive	_ : _ : _ : _ : _ : _					attentive
sensitive	_ : _ : _ : _ : _ : _					insensitive

Simulated Patient Audit
COUGH PROBLEM CHECKLIST

Student _____   Key: 4 = Very Good
                                              3 = Adequate
Rater   _____   2 = Inadequate
                                              1 = Missed
                                              0 = Not Observed

Circle the appropriate number for the item evaluation:

A.   Subjective Data

        obtain name, birthdate   4   3   2   1   0
        obtain CC   4   3   2   1   0
        duration   4   3   2   1   0
        severity   4   3   2   1   0
        course   4   3   2   1   0
        related symptoms   4   3   2   1   0
        meds & allergies   4   3   2   1   0
        cough present/duration   4   3   2   1   0
            smoking habits   4   3   2   1   0
            cough pattern changes   4   3   2   1   0
        shortness of breath   4   3   2   1   0
        history of foreign body inhalation 4 3   2   1   0
        chest pain   4   3   2   1   0
        shaking chills   4   3   2   1   0
        sputum production/character   4   3   2   1   0
        history pul. infection   4   3   2   1   0
        history tuberculin test   4   3   2   1   0
        recent exposure to T.B.   4   3   2   1   0
        sore throat/swallowing pain   4   3   2   1   0
        history exposure to strep   4   3   2   1   0
        runny nose   4   3   2   1   0
        facial/dental pain   4   3   2   1   0
        chronic diseases   4   3   2   1   0

B.   Objective Data

        pt is in respiratory distress   4   3   2   1   0
        obtained vitals   4   3   2   1   0
        sputum obtained   4   3   2   1   0
        sinus tenderness present   4   3   2   1   0
        chest exam   4   3   2   1   0
        throat exam   4   3   2   1   0
        nasal exam   4   3   2   1   0

C.   Laboratory Tests

        chest x-ray   4   3   2   1   0
        tine test/PPD   4   3   2   1   0
        sputum culture   4   3   2   1   0
        throat culture   4   3   2   1   0

SELECTED BIBLIOGRAPHY

Allport, Gordon W.; Vernon, Philip E.; and Lindzey, Gardner. Study of Values: A Scale for Measuring the Dominant Interests in Personality. New York: Houghton Mifflin, 1970.

Asher, Eston J., and Gray, Florence E. "Relation of Personal History Data to College Success," The Journal of Psychology 31(1940), 517-526.

Biomedical Computer Programs. Los Angeles: University of California Press (1973).

Briggs-Myers, Isabel. The Myers-Briggs Type Indicator. Princeton, N.J.: Educational Testing Service, 1962.

_____, and Davis, Junius A. Research Memorandum "Relation of Medical Students Psychological Type to their Special-ties Twelve Year Later," Princeton, N.J.: Educational Testing Service, 1964.

Buhmeyer, K. J. "Curriculum Development and Evaluation for the Physician's Assistant (MEDEX) Program." Unpublished materials collected for the Medical University of South Carolina, 1974.

Burnham, Paul S., and Hewitt, Benjamin A. "Secondary School Grades and Other Data as Predictors of Academic Achieve-ment in College." College and University 48(1972), 21-25.

Campos, Leonard, and McCormick, Paul. Introduce Yourself to Transactional Analysis. Stockton, California: San Joaquin TA Institute, 1972.

Catalanello, Ralph F.; Mingo, Kent A.; and Pinches, George E. "Evaluative Research Design for Health Manpower Innova-tion." Social Science and Medicine 6(1972), 230-239.

Crovitz, Elaine; Huse, Mary M.; and Lewis, David E. "Selection of Physician's Assistants." The Journal of Medical Education. 48(1973), 551-555.

DeMers, Judy. Personal Communications. Seattle: The University of Washington, April 1974.

Dorsey, Joseph L. "Manpower Problems in the Delivery of Primary Medical Care." The New England Journal of Medicine 232(1970), 871-872.

Educational Programs for the Physician's Assistant. Chicago: The American Medical Association (1973).

Eysenck, Hans J. "Student Selection by Means of Psychological Tests - A Critical Survey." The British Journal of Educational Psychology 17, Part I (1947), 20-39.

Flynn, Beverly C.; Ross, Shirly A.; and Chevalier, Robert R. "Characteristics of the Most Successful Students in a Family Nurse Practitioner Program." Proceedings of the Second National Conference on New Health Practitioners. New Orleans, (1974), 28-33.

Gough, Harrison G.; Hall, Wallace B.; and Harris, Robert E. "Admission Procedures as Forcasters of Performance in Medical Training." The Journal of Medical Education 38(1963), 983-998.

Gozali, Harriet; Cleary, T. Anne; Walster, G. William; and Gozali, Joav. "Relationship Between the Internal-External Control Construct and Achievement." The Journal of Educational Psychology 64(1973), 9-14.

Haney, Russell; Michael, William B.; and Gershon, Arthur. "Achievement, Aptitude, and Personality Measures as Predictors of Success in Nursing Training." The Journal of Educational and Psychological Measurement 22(1962), 389-392.

Heikkinen, Charles A. "Open-Closed-Mindedness and Physician's Assistants: An Exploratory Study." The Journal of Medical Education 48(1973), 1013-1018.

Hills, John R. "Prediction of College Grades for all Public Colleges of a State." The Journal of Educational Measurement 1(1964), 154-158.

Jung, Carl G. Psychological Types. London: Rutledge and Kegan Paul, 1923.

Kelly, Francis J.; Beggs, Donald T.; and McNeil, Keith A. Research Design in the Behavioral Sciences: Multiple Regression Approach. Carbondale, Illinois: Southern Illinois University Press, 1969.

Kirk, Roger E. Experimental Design: Procedures for the Behavioral Sciences. Belmont, California: Brooks/ Cole Publishing, 1968.

Lavin, David E. The Prediction of Academic Performance; A Theoretical Analysis and Review of Research. New York: Russell Sage Foundation, 1965.

Leaf, Curtis T. "Prediction of College Success." The Journal of Experimental Education 8(1940), 303-307.

Mallory, John P., and Ivanoff, John M. "Further Uses of the Life Experiences Inventory in Predicting College Achievement." The Journal of Educational Research 57(1964), 522-525.

Maslow, Abraham. Motivation and Personality. New York: Harper Publishing, 1954.

McCaulley, Mary H. "The Myers-Briggs Type Indicator and Health Occupations Education." Cognitive and Affective Dimensions in Health Related Education. Gainesville, Florida: University of Florida Press, 1974.

_____, and Morgan, Margaret K. Selection of Health Manpower: One Possible Solution. Gainesville, Florida: University of Florida Press, 1973.

Marcus, Eric H. "Dogmatism and the Medical Profession." The Journal of Nervous and Mental Disorders 138(1964), 114-118.

Morgan, Margaret K., and Filson, Dolores M. Whither Education for Health Care Delivery. Gainesville, Florida: University of Florida, 1973.

Morse, Kenneth P. Personal Communication. Augusta: The Medical College of Georgia, October 1974.

National Physician Assistant Program Profile 1975-1976. Washington: Association of Physician Assistant Programs (1974).

Nelson, Eugene E.; Jacobs, Arthur R.; and Nelson, J. Phillip. "A Change in the Characteristics of MEDEX Applicants and Trainees." The P.A. Journal 4(1974), 54-64.

Olshaker, Bennett. What Shall We Tell the Kids? New York: Dell Publishing, 1971.

Pharris, Jimmie L. "Prediction Equations for the Selection of Physician's Assistant Trainees." Proceedings of the Second National Conference on New Health Practitioners. New Orleans, (1974), 66-68.

Rokeach, Milton. The Open and Closed Mind. New York: Basic Books, 1960.

Rotter, Julian B. "Generalized Expectancies for Internal Versus External Control of Reinforcement." Psychological Monographs: General and Applied 80(1966), I-28.

Schutz, William C. FIRO: A Three Dimensional Theory of Interpersonal Behavior. New York: Holt, Rinehart, and Winston, 1958.

_____. The FIRO Scale Manual. Palo Alto, California: Consulting Psychological Press, 1967.

Science Education as it Relates to Technical Education. Symposium at the 1968 Annual Meeting of the American Association for the Advancement of Science. Dallas, Texas, 1968.

Scott, Carrie M. "Background and Personal Data as Factors in the Prediction of Scholastic Success in College." The Journal of Applied Psychology 22(1938), 500-506.

Shostrom, Everett L. Personal Orientation Inventory: An Inventory for the Measurement of Self-Actualization. San Diego, California: Educational and Industrial Testing Service, 1970.

Smith, Richard A. "MEDEX." Northwest Medicine 68(1969), 1023-1030.

Stock, William E., and Pratzner, Frank C. "Review of Research on Student Selection and the Prediction of Success in Occupational Education." The Minnesota Research Coordinating Unit in Occupational Education. ERIC Document, ED 039319, 1969.

Stone, LeRoy A.; Bassett, Gerald R.; Brosseau, James D.; DeMers, Judy L.; and Stiening, John A. "Psychological Test Scores for a Group of MEDEX Trainees." Psychological Reports 31(1972), 827-831.

_____, et al. "Psychological Test Characteristics Associated with Training-Success in a MEDEX (Physician Extension) Training Program." Psychological Reports 32(1973), 231-234.

_____, et al. "Cross-Validation of a System for Predicting Training Success of MEDEX Trainees." Psychological Reports 32(1973), 917-918.

_____, et al. "Training Staffs' Multidimensional Perceptions of a Class of MEDEX (Physician Extension) Trainees: A Method of Grading." Perceptual and Motor Skills 36 (1973), 395-402.

Sydnor, Granville L.; Akridge, Robert L.; and Parkhill, Nadine L. Human Relations Training: A Programed Manual. Louisiana: Human Resources Development Training Institute, 1972.

Tompkins, Richard K. Computer-Based Paramedic Support and Audit. Fourth Quarterly Report. Hanover, N.H., July, 1974. Hanover, N.H.: Dartmouth Medical School, 1974.

Thurston, John R.; Brunclik, Helen L.; and Feldhausen, John F. "Personality and the Prediction of Success in Nursing Education." Nursing Research 18(1969), 258-262.

U.S. Department of Health, Education, and Welfare, Office of Education. Third Draft of Standard Terminology for Instruction in Local and State School Systems, Handbook No. 6 of State Educational Records and Reports Series, May, 1967.

Walker, Helen M., and Lev, Joseph. Statistical Inference. New York: Holt, Rinehart, and Winston, 1953.

Weinberg, George H., and Schumaker, John A. Statistics: An Intuitive Approach. Belmont, California: Wadsworth Publishing, 1964.